

A Hand's On Introduction to Conducting Water Rights Investigations

CWCB | DWR

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Colorado's Decision Support Systems

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Colorado Coalition of Land Trusts Conservation Excellence 2014 Conference

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Overview and Training Session

Training Material Contents:

CDSS Overview

Colorado Water Rights and Administration – Review

Querying, Viewing, and Extracting Data from HydroBase via CDSS website

Example 1: I am interested in Ward Ditch in the Bear Creek basin. What information is available on this ditch?

Example 2: What water rights are carried through the Ward Ditch and how have they changed over time?

Example 3: Is there a proposed or decreed Instream Flow Reach near Ward Ditch?

Example 4: Identify wells located on a property, and determine what information is available.

Historical Crop Consumptive Use Analysis – Review

CDSS Products

Estimating Crop Consumptive Use – StateCU

Example 5: Estimating crop CU for a specific ditch using the StateCU Wizard

CDSS Overview

What is CDSS?

“Colorado’s Decision Support System (CDSS) is a water management system developed by the Colorado Water Conservation Board and the Colorado Division of Water Resources for each of Colorado’s major water basins.”

When?

1992	Colorado State Legislature authorized CWCB to conduct a needs analysis and feasibility study for a Colorado River Decision Support System
1992	Colorado River DSS development (HydroBase development)
1998	Rio Grande DSS development
2001	South Platte DSS development
2009	Arkansas DSS Feasibility Study

Why?

To provide the capability to develop and manage credible information on which to base informed decisions concerning water resource management issues including:

- Interstate Compact Issues
- Resources Planning (response to population growth, drought and climate change, environmental issues, etc)
- Water Rights Administration by DWR

How?

- Provide user-friendly access to quality controlled data (data-centered around HydroBase) and spatial information
- Provide data and models to evaluate alternative water development and administration strategies
- Provide a functional, integrated system that can be maintained and upgraded by the State
- Have the capability to accurately represent current and potential federal and state administrative and operational policies and laws
- Promote information sharing among government agencies and water users

Colorado Water Rights Administration - Review

Prior Appropriation Doctrine: “First in time, first in right”. Water rights must be put to *beneficial use* – use of a reasonable amount of water to accomplish the purpose of the appropriation without waste.

Absolute Water Right: a water right that has been placed to beneficial use.

Conditional Water Right: a water right granted in water court that fixes the priority and provides time to complete the appropriation as long as it can be demonstrated that progress is being made toward project completion during six year “diligence” periods.

Due Diligence: demonstrating progress toward perfecting a conditional water right. Historically could be as simple as performing a survey of the ditch alignment, studying available river flow, developing a ground water model, developing a preliminary well design.

Appropriation Date: the date water is first put to beneficial use or steps were first taken to develop.

Adjudication Date: the date water right is decreed in court.

Administration Number: represents both the appropriation and adjudication date, reflecting the water right “place” in the priority system.

Abandonment: relinquished water right due to intentional non-use. Water rights are subject to abandonment if not used in a consecutive 10-year period.

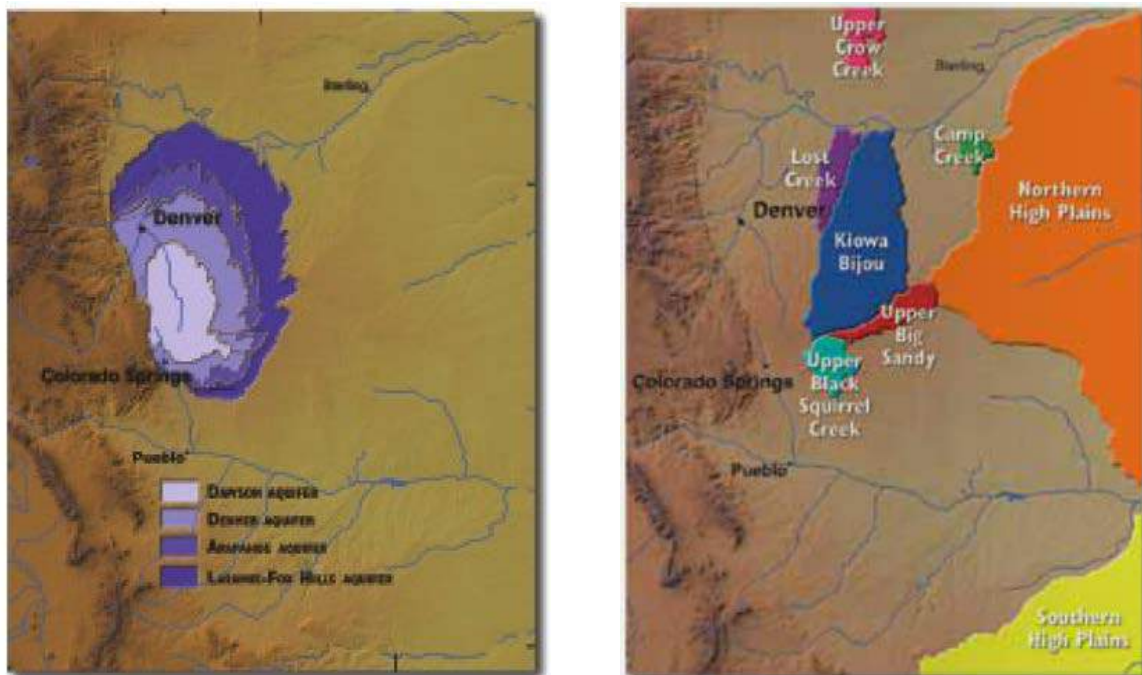
River Call: a water right holder can “place a call” to the Division Engineer indicating they are not receiving their full decreed water right and request that the Division Engineer shut down (curtail) all upstream water rights junior to their calling right.

Over-Appropriated Stream: also termed critical stream or critical reach. Designation simply means there has been water rights administration due to a call at least one time.

Exempt Groundwater: Wells limited to use inside a residential dwelling (no outside uses allowed) with rate < 15 gpm. Pre-1972 permitted wells may have exempt status, >15 gpm, and include some outdoor use or minimal stock watering.

Tributary Groundwater: aquifer that is physically connected to a river system - ground water use affects the flow in the river; river flows affect ground water levels. Non-exempt tributary wells require an augmentation plan if they tributary to a critical stream.

Designated Basin Groundwater: aquifer that has been determined to be “non-tributary” to a stream system; pumping will not affect the stream system within 100 years. Non-tributary ground water can be permitted by the overlying land owner to pump at an annual rate determined to deplete the aquifer at 1 percent per year, with the assumption that the aquifer has a 100-year supply.



Source: Citizen's Guide to Colorado Water Law, CFWE.org

Augmentation Plan: court-approved plan designed to protect existing senior water rights, while allowing junior uses to divert “out of priority”. [An augmentation plan provides a replacement supply – in amount, quality, location, and timing of original water right.](#) Non-exempt well permits tributary to an over-appropriated stream will not be granted a permit without an augmentation plan.

Water rights are decreed for specific use(s). This, plus the fact that water rights can be changed, requires [detailed administrative accounting to be performed by water commissioners.](#)

In Colorado, water is a property that can be sold separately from the land; however, the public retains an interest in the water. This allows for *change of water rights*.

- Change in type of use (ex: from irrigation to municipal; from direct use to storage)
- Change in amount of use
- Change in point of diversion
- Adding points of diversion (alternate points) – can be wells or headgates

Change of water rights must be approved by water court to assure no injury occurs to other water rights.

Change of use and water rights transfers requires an [historical consumptive use analysis \(see Example 5\)](#). An historical consumptive use analysis quantifies the amount of diverted/pumped water that is available for transfer and the location and timing of lagged return flows that must be maintained after the transfer. [Junior water rights are entitled to same conditions on the river.](#)

Interstate Compacts and Agreements: The ability to develop water in Colorado requires is also dependent on meeting obligations with downstream states.

- 9 Compacts; 2 U.S Supreme Court cases; 2 Agreements, 1 Treaty with Mexico
- Agreements vary - Set Delivery Obligations, Delivery Obligations based on Streamflow, Depletion and Storage Restrictions

Divisions and Water Districts: River basin and tributary designations to facilitate water rights administration.

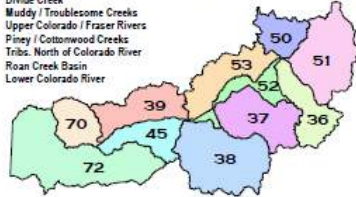
COLORADO BASINS

Colorado Map scale: 1:5,000,000
Individual District scale: 1:3,500,000

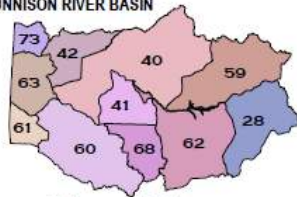
District District Name

- | | |
|----|--------------------------------|
| 36 | Blue River Basin |
| 37 | Eagle River Basin |
| 38 | Roaring Fork River Basin |
| 39 | Rifle / Elk / Parachute Creeks |
| 45 | Divide Creek |
| 50 | Muddy / Troublesome Creeks |
| 51 | Upper Colorado / Fraser Rivers |
| 52 | Piney / Cottonwood Creeks |
| 53 | Tribs. North of Colorado River |
| 70 | Road Creek Basin |
| 72 | Lower Colorado River |

COLORADO RIVER BASIN



GUNNISON RIVER BASIN



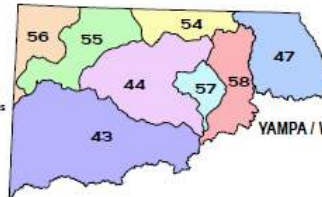
District District Name

- | | |
|----|------------------------|
| 28 | Tomichi Creek |
| 40 | North Fork / Tribs. |
| 41 | Lower Uncompaghe River |
| 42 | Lower Gunnison River |
| 59 | East River Basin |
| 60 | San Miguel River Basin |
| 61 | Paradox Creek |
| 62 | Upper Gunnison River |
| 63 | Dolores River Basin |
| 68 | Upper Uncompaghe River |
| 73 | Little Dolores River |



District District Name

- | | |
|----|----------------------------|
| 43 | White River Basin |
| 44 | Lower Yampa River |
| 47 | North Platte River Basin |
| 54 | Slater / Timberlake Creeks |
| 55 | Little Snake River |
| 56 | Green River Basin |
| 57 | Middle Yampa River |
| 58 | Upper Yampa River |



YAMPA / WHITE RIVER BASIN

STATE OF COLORADO RIVER BASINS

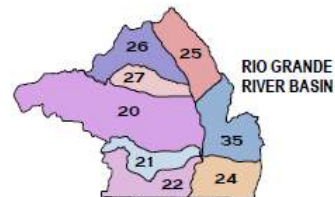


SAN JUAN / DOLORES RIVER BASIN



District District Name

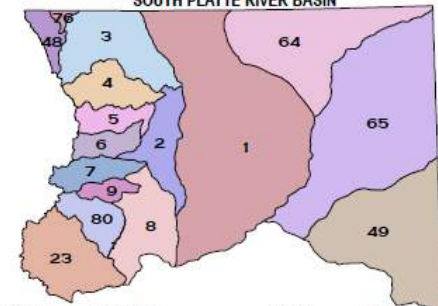
- | | |
|----|-----------------------------|
| 29 | San Juan River Basin |
| 30 | Animas River Basin |
| 31 | Los Pinos River Basin |
| 32 | McElmo Creek Basin |
| 33 | La Plata River Basin |
| 34 | Mancos River Basin |
| 46 | Navajo Reservoir |
| 69 | Disappointment Creek Basin |
| 71 | West Dolores Creek / Tribs. |
| 77 | Navajo River Basin |
| 78 | Piedra River Basin |



District District Name

- | | |
|----|-----------------|
| 20 | Rio Grande |
| 21 | Alamosa La Jara |
| 22 | Conejos River |
| 24 | Culebra Creek |
| 25 | San Luis Creek |
| 26 | Saguache Creek |
| 27 | Cañero Creek |
| 35 | Timbisha Creek |

SOUTH PLATTE RIVER BASIN



District District Name

- | | |
|---|---------------------------------------|
| 1 | South Platte: Greeley to Balzac |
| 2 | South Platte: Denver Gage to Greeley |
| 3 | Catche La Poudre River |
| 4 | Big Thompson River |
| 5 | St. Vrain Creek |
| 6 | Boulder Creek |
| 7 | Clear Creek |
| 8 | South Platte: Cheesman to Denver Gage |

District District Name

- | | |
|----|------------------------------------|
| 9 | Bear Creek |
| 23 | Upper South Platte |
| 48 | Laramie River |
| 49 | Republican River |
| 64 | South Platte: Balzac to State Line |
| 65 | Arkaree River |
| 76 | Sand Creek |
| 80 | North Fork of South Platte |

ARKANSAS RIVER BASIN



District District Name

- | | |
|----|--------------------------------|
| 10 | Fountain Creek |
| 11 | Arkansas: Headwaters to Salida |
| 12 | Arkansas: Salida to Portland |
| 13 | West Mountain Valley |
| 14 | Arkansas: Portland to Fowler |
| 15 | Saint Charles |
| 16 | Cucharas River |

District District Name

- | | |
|----|------------------------------------|
| 17 | Arkansas: Fowler to Las Animas |
| 18 | Apishapa River |
| 19 | Purgatoire River |
| 66 | Cimarron River Basin |
| 67 | Arkansas: Las Animas to State Line |
| 79 | Huerfano River |

WDID: Each water right location (decreed or conditional) has been assigned a 3 or 4 digit integer identifier which, when combined with the Water District, is unique and can be used to query information in HydroBase (termed WDID). In general:

- River Diversion IDs are between 100 and 1999
- Instream flow IDs are between 2000 and 2999
- Reservoir IDs are between 3000 and 3999
- Transbasin IDS are between 4000 and 4999
- Well IDs are greater than 5000

This rule of thumb still applies to 99 percent of water rights, but is no longer expected to be adhered to in the future.

For example, the WDID for Larimer County Canal is 0300911 where 03 indicates the structure is in Water District 3, and 911 is the unique identifier for the ditch headgate location. All of Larimer County Canal's over 50 water rights are "associated" with WDID 0300911 in HydroBase.

Tip: The Citizen's Guide to Colorado Water Law, prepared by the Colorado Foundation for Water Education, is an educational booklet that provides information on many water related topics including the Basics of the Prior Appropriation System, Types of Groundwater, and Water Court Proceedings. This Guide is available from the Colorado Foundation for Water Education website (www.cfwe.org).

Example 1: I am interested in Ward Ditch in the Bear Creek basin. What information is available on this ditch?

Step 1: Locate the diversion structure and view nearby structures.

If you are a GIS user, you can use the CDSS GIS layers or Geodatabase to spatially locate and identify diversion structures, stream gages and irrigated acreage. If you are not a GIS user, or want to quickly identify nearby features, use the CDSS Map Viewer. Select the **Map Viewer** tab on the CDSS homepage and click on **Accept Disclaimer and open CDSS Map Viewer**. ****You will need to turn off the Popup blocker****

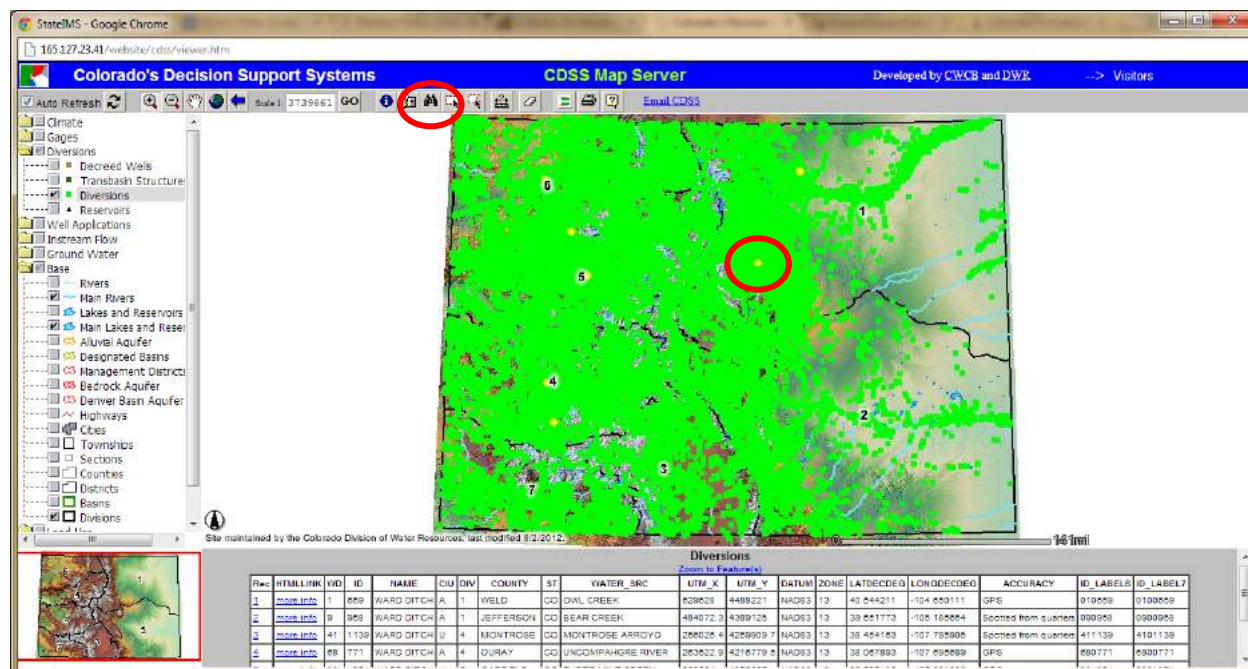
The image shows two screenshots of the Colorado's Decision Support Systems (CDSS) website. The top screenshot is the homepage, which features a header with the CWCB and DWR logos, a search bar, and a navigation menu. The main content area is a table with six columns: Basins, Online Tools, Software Products, Modeling Data, GIS Data, and Documents. The 'Map Viewer' link under the 'Online Tools' column is circled in red. The bottom screenshot is the CDSS Map Viewer interface, which displays a map of Colorado with various water resources layers. The map shows the Colorado River and its tributaries, with numbered points (1-7) indicating specific locations. The interface includes a legend on the left, a scale bar, and a status bar at the bottom.

Basins	Online Tools	Software Products	Modeling Data	GIS Data	Documents
Arkansas	Call Chronology	StateCU	Consumptive Use (StateCU)	Division 1 South Platte	Basin Reports
Colorado	Streamflow Stations	StateDML	Surface Water (StateMod)	Division 2 Arkansas	Meeting Materials
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Yampa / White		Third Party Software		Division 7 San Juan /	

Similar to other map viewer programs, you can zoom, pan, and identify information. The StateIMS User Manual, which includes instructions to zoom, pan, display specific GIS layers, and select features, is available on-line by selecting the *question*  button.

Display specific layers by clicking the check box next to the layer name. You can also use the *find*  button to select a specific diversions, climate stations, or gage stations.

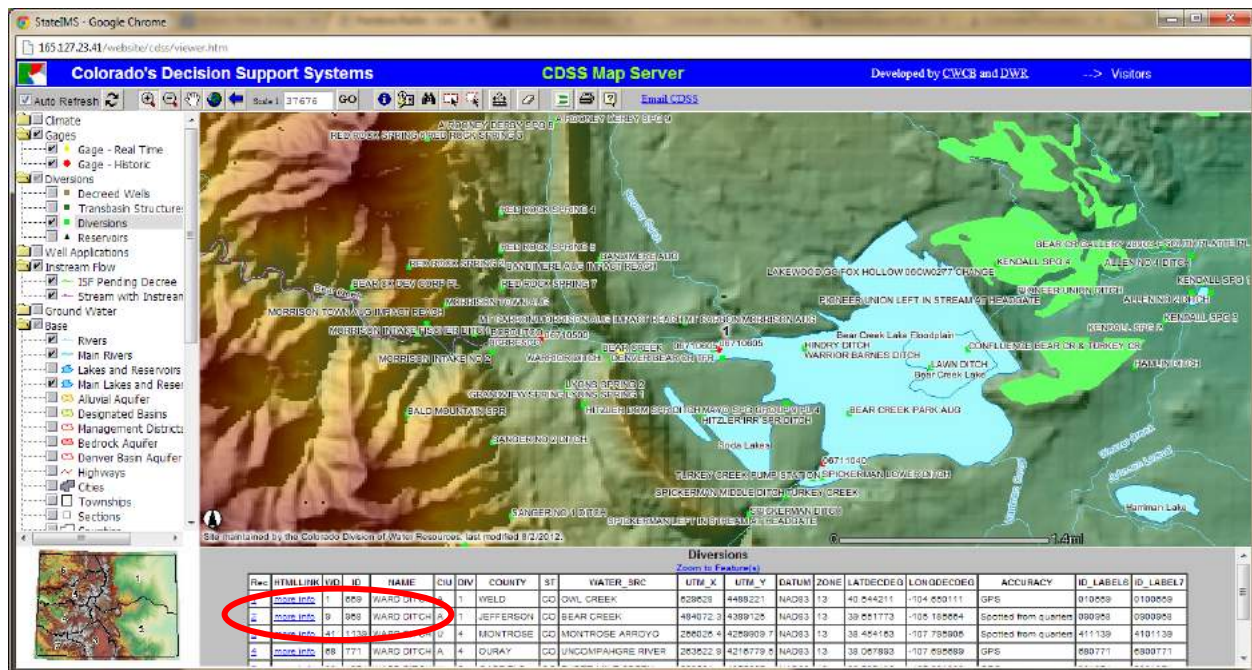
To select specific features, the layer name in the layer list must be active – click the layer name, making sure it is highlighted gray. Activate the **Diversions** layer and select diversions, using the *find* button, search for the diversion station of interest. In this example, search for “Ward Ditch”. Click Find - the structures resulting from the query will be highlighted on the map.



Using the zoom features , zoom to the Ward Ditch located in the southwest corner of the South Platte Basin. Turn on other layers to view nearby structures including:

- Rivers in Base Folder
- Pending and Decreed Instream Flow Reaches in the Instream Flow folder (see Example 3)
- 2005 Irrigated Acreage in the Land Use Folder
- Real Time and Historical Streamflow Gages in the Gage Folder

Tip: Climate data recorded at nearby stations provides the basis for the historical consumptive use estimates calculated through daily or monthly consumptive use equations (e.g. Blaney-Criddle, ASCE Standardized Penman-Montheith). A Historical Crop Consumptive Use Analysis Review is available at the back of this training manual.



View more about a Feature by selecting [more info](#). This takes you to the CDSS Structure Data Selector window.

Step 2: View information available for the diversion structure, which can provide clues and help determine the “right questions” to ask the Water Commissioner.

Highlight the structure in the Data Selector window and select the **Structure Summary** button. Specify the information you want to review, and select the **Get Structure Summary** button.

Water Division/District: Last Refresh Date: 2012-07-22

Structure Type:

Structure Name: To

Select a row from the search results below to activate the reporting features

Div	WD	Structure ID	Structure Name	Q10	Q40	Q160	Sect	Twshp	Range	PM	Distance From N/S Line	Distance From E/W Line	Water Source	Stream Mile	Ow
1	9	958	WARD DITCH	NE	NE	NE	2	SS	70W	S			BEAR CREEK		

1 records returned

Results List Report:

Structure Reports:

Web CDSS Structure Data Selector Version 1.10.29.04 © 2007 Division of Water Resources - State of Colorado

Structure Summary Detail - Windows In...

<http://cdss.state.co.us/structure/StructureDetail.aspx>

Water Rights Data:

- ☒ Water Rights Transaction Summary
- ☒ Water Rights Net Amounts
- ☒ Irrigated Acres Summary
- ☒ Irrigated Acres From GIS Data

Diversion Records

- ☒ Totals
- ☒ Diversion Comments

[Cancel and Close Window](#)

Information available in the Structure Summary Report is stored in HydroBase, the State of Colorado's water resources database.

Tip: Start with the Structure Summary when investigating diversions. The summary reports all available information, including source, legal locations, water rights information, irrigated acreage information, monthly diversions, and water commissioner comments.

www.dwr.state.co.us/Structure/StructureSummaryReport.aspx - Google Chrome

www.dwr.state.co.us/Structure/StructureSummaryReport.aspx

Structure Summary Report

State of Colorado HydroBase

Structure Name: WARD DITCH **Water District:** 9 **Structure ID Number:** 958

Source: BEAR CREEK

Location: Q10 Q40 Q160 Section Township Range PM
NE NE NE 2 5S 70W S

Distance From Section Lines: From N/S Line: From E/W Line:
UTM Coordinates (NAD 83): Northing (UTM y): 4389144 Easting (UTM x): 484088 Spotted from PLSS distances from section lines
Latitude/Longitude (decimal degrees): 39.651944 -105.185473

Water Rights Summary:

Total Decreed Rate(s) (CFS):	Absolute:	13.8983	Conditional:	0.0000	AP/EX:	0.0000
Total Decreed Volume(s) (AF):	Absolute:	0.0000	Conditional:	0.0000	AP/EX:	0.0000

Water Rights -- Transactions

Case Number	Adjudication Date	Appropriation Date	Administration Number	Order Number	Priority Number	Decreed Amount	Adjudication Type	Uses	Action Comment
81CW0104	1884-02-04	1861-12-01	4353.00000	0		0.9710 C	O,TT	1Q	TFR FM WARRIOR/HARRIMAN D 06/14/1983
CA91471	1935-09-24	1862-04-15	4488.00000	0		0.0500 C	O	89	TB-7 DELIVERED THROUGH HINDRY D
81CW0104	1884-02-04	1864-10-31	5418.00000	0		2.0058 C	O,TT	1Q	TFR FM WARRIOR/HARRIMAN D 06/14/1983
81CW0104	1884-02-04	1865-04-01	5570.00000	0		0.9048 C	O,TT	1Q	TFR FM WARRIOR/HARRIMAN D 06/14/1983
84CW0204	1884-02-04	1882-12-06	12028.00000	0		53.0000 C	O,AB	1	ABAN 02/03/1988
93CW0053	1884-02-04	1882-12-06	12028.00000	0		0.0333 C	O,TF	1	KENT WELL AUG CHNG USE 02/27/1995
CA6832	1884-02-04	1882-12-06	12028.00000	0		63.0000 C	O	1	23 ASP 52.86

Water Rights -- Net Amounts

Adjudication Date	Appropriation Date	Administration Number	Order Number	Priority/Case Number	Rate (CFS)			Volume (Acre-Feet)		
					Absolute	Conditional	AP/EX	Absolute	Conditional	AP/EX
1884-02-04	1861-12-01	4353.00000	0	81CW0104	0.9710	0	0			
1935-09-24	1862-04-15	4488.00000	0	CA91471	0.0500	0	0			
1884-02-04	1864-10-31	5418.00000	0	81CW0104	2.0058	0	0			
1884-02-04	1865-04-01	5570.00000	0	81CW0104	0.9048	0	0			
1884-02-04	1882-12-06	12028.00000	0	93CW0053	9.9667	0	0			

Review the "anatomy" of the **Structure Summary Report** for information regarding the ditch.

- Water Rights
 - Transactions reflect the "history" of the water rights including transfers and abandonment
 - Net Amounts reflect the current status of water rights associated with the ditch
 - Adjudication and Appropriation Dates reflect the seniority of the water right
 - Adjudication Type
 - (See Example 2 for more information on the water rights and decrees)
- Irrigated Acreage
 - Land Use by crop type
 - Assessment Year (availability differs depending on Division)
 - Irrigation Method is pertinent to efficiency

- Diversion Summary
 - Total Diversions reflect total water for all uses
 - Diversion Comments reflect anecdotal information from the Water Commissioner

Tip: To verify irrigated acreage, review the “GIS” acreage from State assessments and compare to Diversion Comment acreage (provided by the Water Commissioner). If significantly different, ask the Water Commissioner for confirmation.

Step 3: View the diversion records for the ditch, which reflect historical use.

Close the **Structure Summary Report** and choose the **Diversion Records** button. Available time-steps and diversion classifications will be presented, as outlined in the Diversion Records Standard Handbook (effect. November 1, 2010). Diversion data is generally recorded as daily records, and aggregated to monthly records within HydroBase.

On-Line Diversion Records - Google Chrome

www.dwr.state.co.us/Structure/DiversionRecords.aspx

Diversion Records:

	Type	Time Step	Identifier	Quality	Start Year	End Year	Meas Count
	Diversion	Annual	Total		1951	2012	576
	Diversion	Annual	S:2 F: U:1 T: G:		1959	1959	636
	Diversion	Annual	S:2 F: U:0 T: G:		1951	1958	3180
	Diversion	Annual	S:1 F: U:Q T:3 G:		1988	2010	11448
	Diversion	Annual	S:1 F: U:Q T: G:		2011	2012	1272
	Diversion	Annual	S:1 F: U:1 T: G:		1951	2012	29892
	Diversion	Annual	S:1 F: U:0 T: G:		1992	1995	1272
	Diversion	Daily	Total		1951	2012	5703
	Diversion	Daily	S:2 F: U:1 T: G:		1959	1959	30

*** = Infrequent Diversion Record**

To select multiple diversion records in the grid above, hold the Ctrl key and click on each row to select. Click again to unselect.

☐ Diversion Comments (1950 - 2011)

Reservoir/Release Data:

☐ Summary (N/A)

☐ Measurements (N/A)

Report Options:

Start: 1950 To: 2012

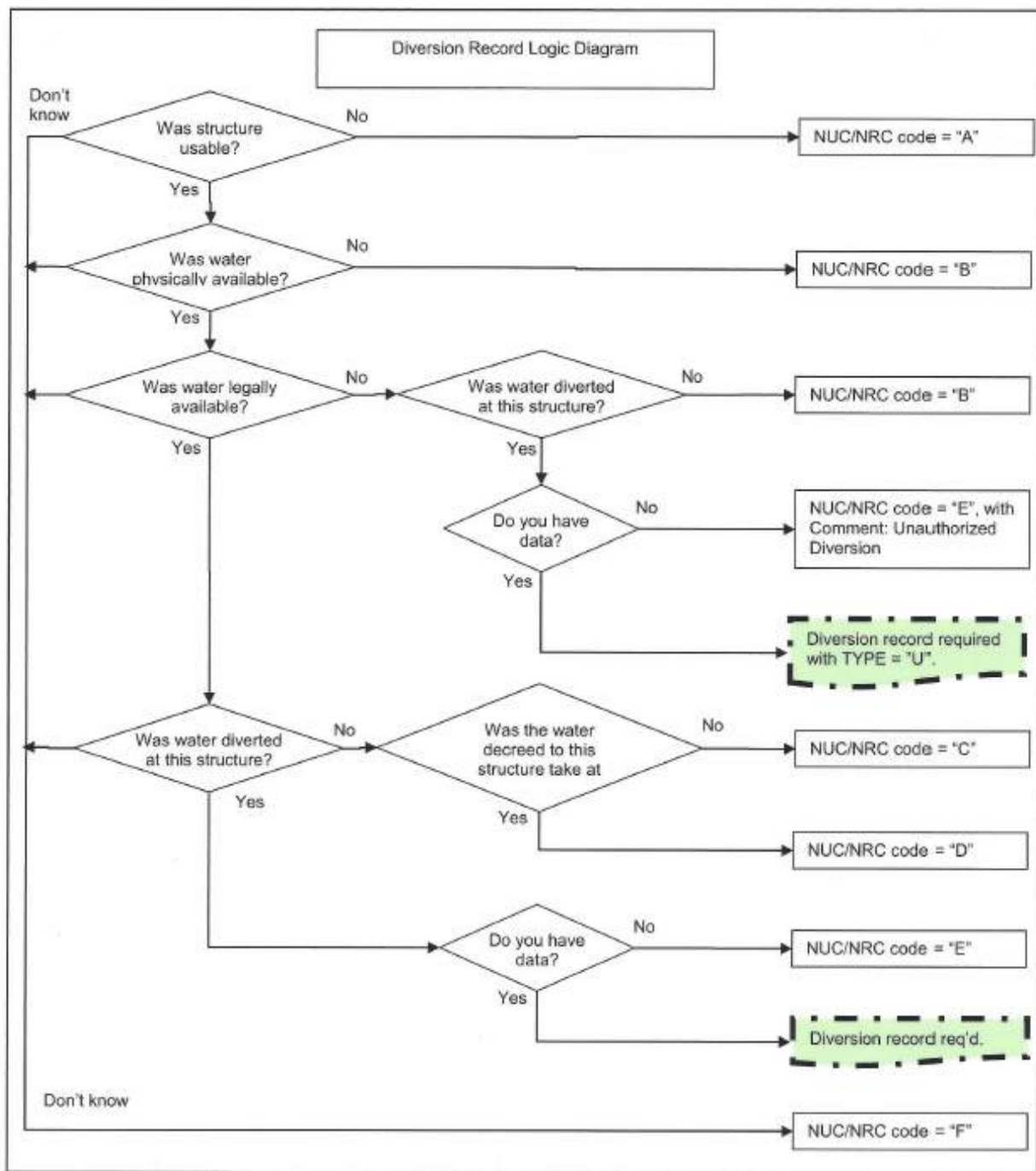
Summary Export

[Cancel and Close Window](#)

River diversions and reservoir releases are coded by source, location of source, use, and type – known as DivClass or SFUTG, where G lists an augmentation plan). The Diversion Records Standard Handbook

describes standard diversion and use codes and provides examples of how to code specific diversions. The following tables are directly from the Water Commissioner Handbook. Additionally, there are standard codes used in Water Commissioner comments that provide information in lieu of diversion records (NUC Codes).

Appendix A: Diversion Record Logic Diagram



Appendix B: Quick Guide to Diversion Record Codes

SOURCE Code ¹		USE Code ¹		Not Used/Not Released Code (NUC/NRC)	
1	Natural Stream Flow	0	Storage		Blank is acceptable
2	Reservoir Storage	1	Irrigation	A	Structure not usable
3	Ground Water	2	Municipal	B	No water available
4	Transbasin Water	3	Commercial	C	Water available, but not taken
5	Non-Stream Flow	4	Industrial	D	Water taken in another structure
8	Re-usable Water	5	Recreation	E	Water taken, but no data available
X ²	Unspecified	6	Fishery	F	No information available
		7	Fire		
		8	Domestic		
		9	Stock		
		A	Augmentation		
		B	Sub-basin export		
		C	Change of Use Return Flows		
		E	Evaporation		
		F	Federal reserved		
		G	Geothermal		
		H	Household use only		
		K	Snow making		
		M	Minimum stream flow/lake level		
		P	Power generation		
		Q	Quantification of amount		
		R	Recharge		
		S	Export from State		
		T	Transbasin export		
		W	Wildlife		
		Z	Other		
TYPE Code ¹				Structure Type Allowed to have a Diversion Record ⁴	
	Blank is acceptable			1	Ditch N
Types of diversions				2	Well N
1	Exchange			WG	Well Group N
2	Trade			4	Spring N
4	Alternate Point of Diversion			5	Seep N
A	Authorized/Augmented			6	Mine N
U	Unauthorized Diversion			7	Pipeline N
D	Out-of-priority Depletion			8	Pump N
J	In-priority Depletion			9	Power Plant N
Types of releases				0	Other N
7	Released to Stream			M	Measuring Point N
8	Released Off-stream			MF	Minimum Flow N
L	Release of Dominion and Control			R	Reach (Non-Aggregating) N
E	Release of Excess Diversion			WF	Well Field A
Q	Release of Quantified Amount			3	Reservoir A
V ³	Release to Alluvial Aquifer			RS	Reservoir System A
W	Released Underground			RA	Recharge Area A
Types of data				AR	Aggregating Reach A
0	Administrative Record Only				
R	USE Only Volume Data				
		OBSERVATION Code		Structure Type NOT Allowed to have a Diversion Record	
		*	Observed	AQ	Aquifer NNT/NT Reservation
		U	User Supplied - Unknown Reliability	DS	Ditch System
		K	User Supplied - Known Reliability	EP	Exchange Plan
		E	Estimated	P	Augmentation/Replacement Plan
		C	Calculated		

¹ For more complete definitions see Table 5-8, Table 5-9 and Table 5-10.

² SOURCE "X" should not be used as the only record for a structure as it provides no understanding regarding the SOURCE of water diverted.

³ TYPE "V" releases are associated with water that will accrete to the natural stream.

⁴ Structure Types are divided into "Aggregating" (A) and "Non-Aggregating" (N); see Section 9.2.

Tip: Daily records for senior ditches can provide an indication of the minimum flow in a reach during the irrigation season on streams with no gaged data. Diversions classes can identify how much flow in the river is non-native (from reservoir releases or transbasin diversions). If senior ditches routinely divert less than decree, questions to ask the Water Commissioner include “Are they taking less than their decree because they don’t have the demand for the water? Is there a physical water limitation? Is there a legal water limitation?” Infrequent diversion records often include annual totals for ditches infrequently visited by the water commissioner.

Diversion coding indicates that Ward Ditch generally the ditch diverts for direct irrigation and “carries” water to other structures (S:1 U:Q T:3). Note that this diversion coding was used frequently in the past for many types of diversions, and is no longer available. More discreet coding is now required to reflect the source and destination of all diversions.

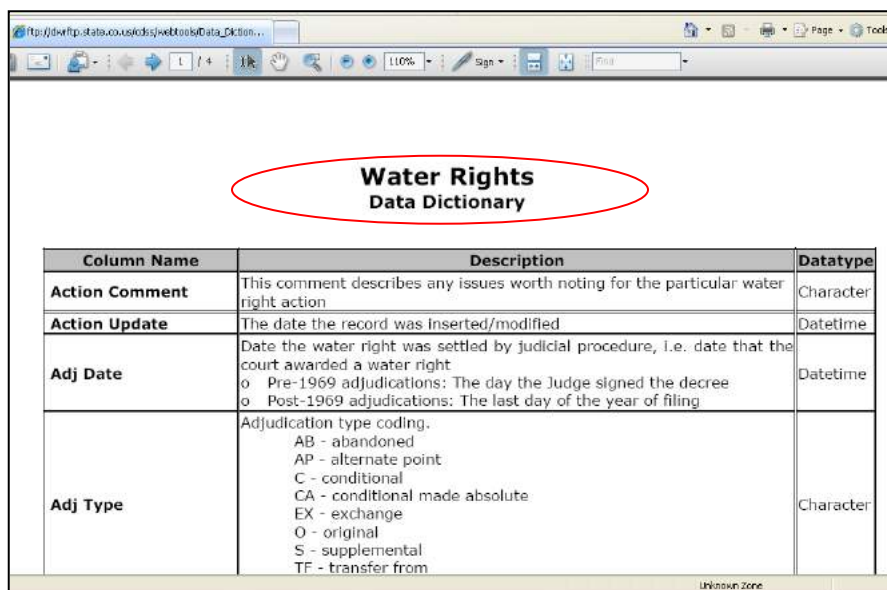
Individual or multiple Diversion Records can be viewed by choosing the **Summary** button or exported by choosing **Export** to save in text file or to open in Microsoft Excel.

Tip: “Shares” in irrigation districts are not stored in HydroBase. To determine the amount of share ownership, inquire with the Water Commissioner or the District itself.

Example 2: What water rights are carried through the Ward Ditch and how have they changed over time?

Step 1: Find the water rights transactions for Ward Ditch.

Select **Water Rights** from the **Online Tools** tab drop-down on the menu bar of the CDSS home. Help Files available include the **Water Rights Data Dictionary**, which provides a description of water rights information stored in HydroBase, including use types. The Water Right Data Dictionary can be viewed and/or printed. *****Note that some of this information has been revised in the new Diversion Records Standard Handbook******



Column Name	Description	Datatype
Action Comment	This comment describes any issues worth noting for the particular water right action	Character
Action Update	The date the record was inserted/modified	Datetime
Adj Date	Date the water right was settled by judicial procedure, i.e. date that the court awarded a water right o Pre-1969 adjudications: The day the Judge signed the decree o Post-1969 adjudications: The last day of the year of filing	Datetime
Adj Type	Adjudication type coding. AB - abandoned AP - alternate point C - conditional CA - conditional made absolute EX - exchange O - original S - supplemental TF - transfer from	Character

The **Water Rights Help File** provides step by step instructions for querying water rights information.

Water Rights

Description with Step by Step Instructions

Description:

The Water Rights information tool returns data describing water rights: location of the structure on which the water right is declared, legal attributes of the case, and properties of the case.

Water Right data may be selected using a combination of:

- **Division/Water District**
- **Structure Type**
- **Water Right Type**

And may be further refined using one of the following criteria:

- **Water Right Name**
- **Case Number**
- **Source**
- **Priority Number**
- **Legal Location**
- **Use**
- **Decreed Amount**
- **Structure ID**

Refine the query by selecting **Water Division/District 9 – Bear Creek**. Select **Water Right Name Starts With Ward**. Note that there are 33 water rights transaction records returned.

Developed for Internet Explorer version 8 or higher.

Division/Water District: ...9 - Bear Creek **Date Last Refreshed:** 2012-07-22

Structure Type: All Structures

Water Right Type: Transaction List **Sort Order:** Alpha (Structure)

Water Right Name Case Number Source Priority Number Legal Location Use Decreed Amount

Water Right Name: Starts With Ward

Submit Request Help?

	Images	DIV	WD	ID	Water Right Name	Water Source	Q10	Q40	Q160	Sect	Twshp	Range	PM	Count
		1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF
		1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF
		1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF
		1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF
		1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF
		1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF

33 records returned

Output Options.

Water Rights Report by Structure Name (Adobe)

Generate Output

Web CDSS Water Rights Data Selector Version 1.09.12.32 © 2008 Division of Water Resources - State of Colorado

To limit the records to the Ward Ditch on Bear Creek, query again by Structure ID (958). Select **Water Rights Report by Structure Name (Adobe)** in the Output Options.

Developed for Internet Explorer version 8 or higher.

Division/Water District: Date Last Refreshed: 2012-07-22

Structure Type:

Water Right Type: Sort Order:

Case Number Source Priority Number Legal Location Use Decreed Amount Structure ID

Structure ID: To:

[Submit Request](#)

[Help?](#)

Images	DIV	WD	ID	Water Right Name	Water Source	Q10	Q40	Q160	Sect	Twshp	Range	PM	County	Adj Date
	1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF	1884-02-1
	1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF	1935-09-1
	1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF	1884-02-1
	1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF	1884-02-1
	1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF	1884-02-1
	1	9	958	WARD DITCH	BEAR CREEK	NE	NE	NE	2	5S	70W	S	JEF	1884-02-1

7 records returned

Output Options:

[Generate Output](#)

Web CDSS Water Rights Data Selector Version 1.09.12.32 © 2008 Division of Water Resources - State of Colorado

www.dwr.state.co.us/WaterRights/WRReporting.aspx - Google Chrome

www.dwr.state.co.us/WaterRights/WRReporting.aspx

Water Rights Report by Structure Name

State of Colorado

WD	ID	Water Right Name	Struct Type	Stream Information	Legal Location	Use Type	Decreed Amt	U	Adj. Type	Adj. Date	Padj Date	Appt Date	Admin No	D #	Priority No	Court Case	Seq #	PIA	Alter ID	Comment
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	1Q	0.9710	C	O,TT	1884-02-04		1931-12-01	4353.00000	0		81CW9104				TFR FM WARRIOR/HARRIMAN D 03/14/1983
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	89	0.0500	C	O	1935-09-24		1952-04-15	4488.00000	0		CA91471				TB-7 DELIVERED THROUGH MINORITY D
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	1Q	2.0058	C	O,TT	1884-02-04		1864-10-31	5418.00000	0		81CW9104				TFR FM WARRIOR/HARRIMAN D 03/14/1983
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	1Q	0.9046	C	O,TT	1884-02-04		1855-04-01	5570.00000	0		81CW9104				TFR FM WARRIOR/HARRIMAN D 03/14/1983
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	1	53.0000	C	O,AB	1864-02-04		1992-12-06	12028.00000	0		84CW0204				ABAN 02/03/1988
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	1	0.0333	C	O,TF	1884-02-04		1992-12-06	12028.00000	0		53CW9053			R0902091	KENT WELL AUG CHNG USE 02/27/1995
9	958	WARD DITCH	1	4 BEAR CREEK	JEF NE NE NE 2 S 3 70 W S	1	63.0000	C	O	1884-02-04		1992-12-06	12028.00000	0		CA6832				23 ASP 52.86

Explanation of Codes:

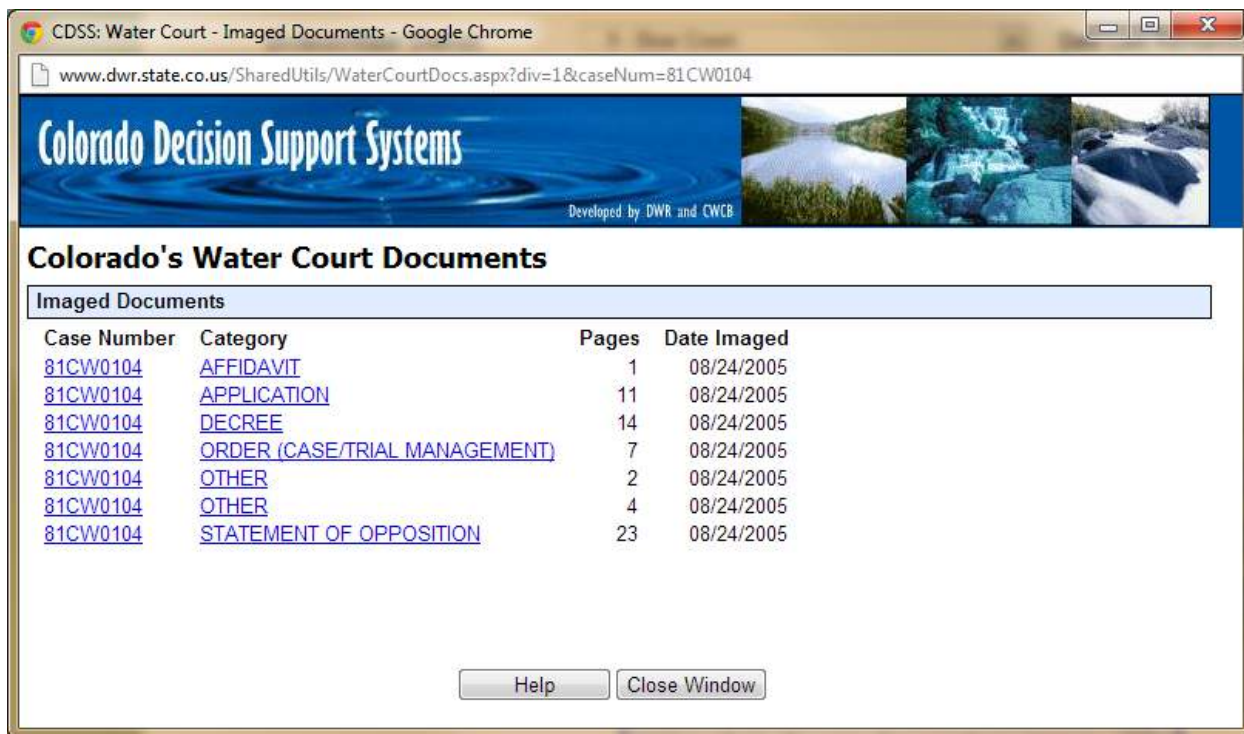
Struct Type: 0 - other, 1 - ditch, 2 - well, 3 - reservoir, 4 - spring, 5 - seep, 6 - mine, 7 - pipeline, 8 - pump, 9 - power plant

Use Codes: 0 - storage, 1 - irrigation, 2 - municipal, 3 - commercial, 4 - industrial, 5 - recreation, 6 - fishery, 7 - fire, 8 - domestic, 9 - stock, A - augmentation, B - export from basin, C - cumulative accretion to river, D - cumulative depletion from river, E - evaporation, F - federal reserve, G - geothermal, H - household use only, K - snow making, M - minimum streamflow, N - net effect of river, P - power generation, Q - other, R - recharge, S - export from state, T - transmountain export, W - wildlife, X - all beneficial use

Adj. Type: AB - abandoned, AP - alternate point, C - conditional, CA - conditional made absolute, EX - exchange, O - original, S - supplemental, TF - transfer from, TT - transfer to

Admin Number is a number developed by DWR to provide a simple and efficient method of ranking decrees in order of seniority.

There are five individual water rights carried by Ward Ditch, many of the senior water rights are transferred from Warrior/Harriman Ditch. Individual water rights transactions occurred under five separate Court Cases. Note that 53 cfs of the junior water right was abandoned in 1988. Click on **Images** next to each water right transaction to view the Decree associated with the water right transaction.



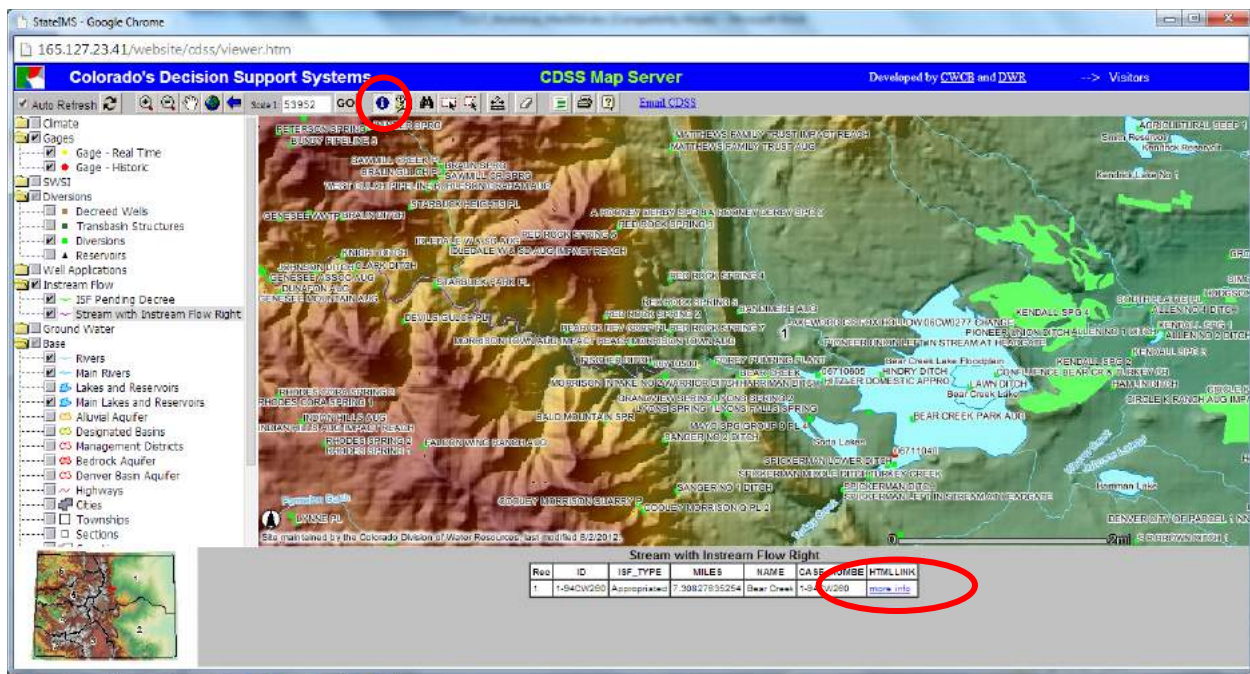
Tip: There are several options to narrow down the search of water rights in HydroBase. The tabs that refine searches cannot currently be used in conjunction, so choose a narrowing search then use Excel to sort and categorize further.

Tip: Decreed and conditional water right rates are stored in HydroBase as a text field. If you choose the “Export as Excel” option when querying HydroBase, you will need to convert text columns to values to be able to use arithmetic functions, such as summing or averaging. If you save the output as a CSV file, it automatically brings rates and other numbers into Excel as a value field.

Example 3: Is there a decreed Instream Flow Reach near Ward Ditch?

Step 1: Use the Map Viewer to identify nearby Instream Flow Reaches.

Toggle back to the Map Viewer screen to view Ward Ditch and nearby structures. In Example 1, the **ISF Pending Decree** and **Stream with Instream Flow Right** layers were turned on. There appears to be a decreed ISF reach just upstream of Ward Ditch on Bear Creek. To identify the ISF Reach and obtain additional information on it, first activate the **Stream with Instream Flow Right** layer – click the layer name making sure it is highlighted gray. Next, click on the *identify*  button to enable this functionality in the Map Viewer. Then click on the decreed ISF feature (purple line) in the Map Viewer just upstream of the Ward Ditch diversion point.



View more about a Feature by selecting [more info](#). This takes you to the CWCB Instream Flow Water Rights Database.

Step 2: View information available for the decreed ISF Reach, including reach extents and water rights.

The CWCB Stream Cases Physical Information Summary provides information on the Bear Creek ISF Reach located just upstream of Ward Ditch. Based on the summary, this ISF reach was appropriated in 1994 for 15 cfs in the summer months (April – October) and 7 cfs during the winter (October – March). The summary provides the reach termini, however it may be easier to view the ISF reach extent using the Map Viewer.

Colorado's Decision Support Systems CWCB Stream Cases - Seq

165.127.23.41/cwcb.state.co.us/Apps/StreamLakeWaterRights/detail.asp?seq=1-94CW260

Apps CDSS Coyote Gulch

CWCB Stream Cases

Physical Information Summary:

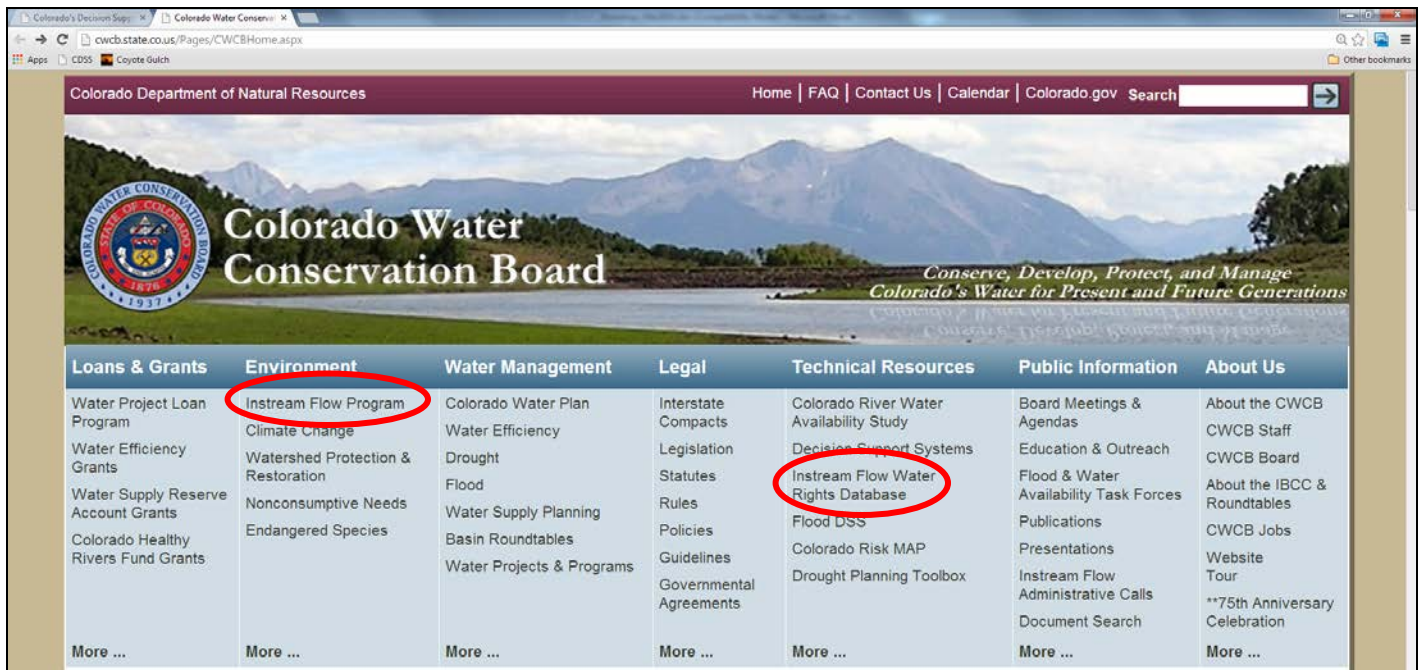
Case Number: 1-94CW260
Stream Name: Bear Creek
CDOW #: 10075

Water Division: 1
Water District: 9
Segment Length: 8.2 miles
Watershed: Upper South Platte (10190002)

County: Jefferson
Upper Terminus: confd Swede Gulch in SE NW S36 T4S R71W 6PM
Lower Terminus: hdgt Harriman Ditch in NE NW S2 T5S R70W 6PM

Appropriation Date: 9/13/1994
Instream Flow Recommendation: 7 cfs (10/16 - 3/31)
15 cfs (4/1 - 10/15)

Additional information regarding the CWCB Instream Flow Program can be found on the CWCB website (cwcb.state.co.us).



Instream Flow Program information:

- Instream Flow FAQs, Statutes, and Rules
- Water Acquisitions Program and Proposed Acquisitions: a voluntary program that allows water rights' owners to donate, sell, lease or loan existing decreed water rights to the CWCB on a permanent or temporary basis.
- Annual Lists of Recommended ISF Appropriations

Instream Flow Water Rights Database information:

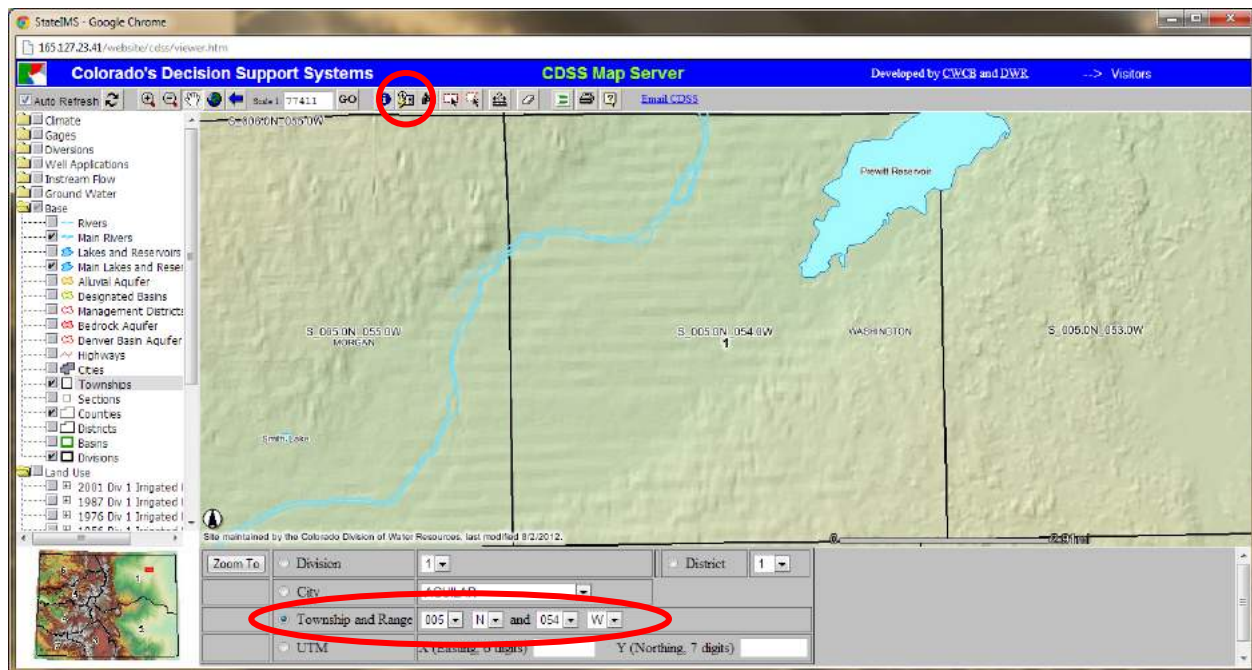
- Searchable database for ISF and Natural Lake Water Rights
- Query by County, Division, Case Number, Stream Name, or Watershed
- Results in a Physical Information Summary

Example 4: Identify wells located on a property, and determine what information is available.

Step 1: Locate a specific Township/Range/Section and view structures and information located in the area of interest.

As with Example 1, if you are a GIS user, you can use the CDSS GIS layers or Geodatabase to spatially locate and identify wells and irrigated acreage associated with a specific location. For this example, we will use the CDSS Map Viewer and search for wells in **Section 16, Township 5N, Range 54W**.

The CDSS Map Viewer has the functionality to Zoom To specific locations. Click on the  feature and use the parameters to find Township 5N, Range 54W.



Turn on additional layers to view pertinent information including:

- Sections in the Base Folder
- 2005 Irrigated Acreage in the Land Use Folder
- Decreed Wells in the Diversions Folder
- Wells by Permit Number in the Well Applications Folder

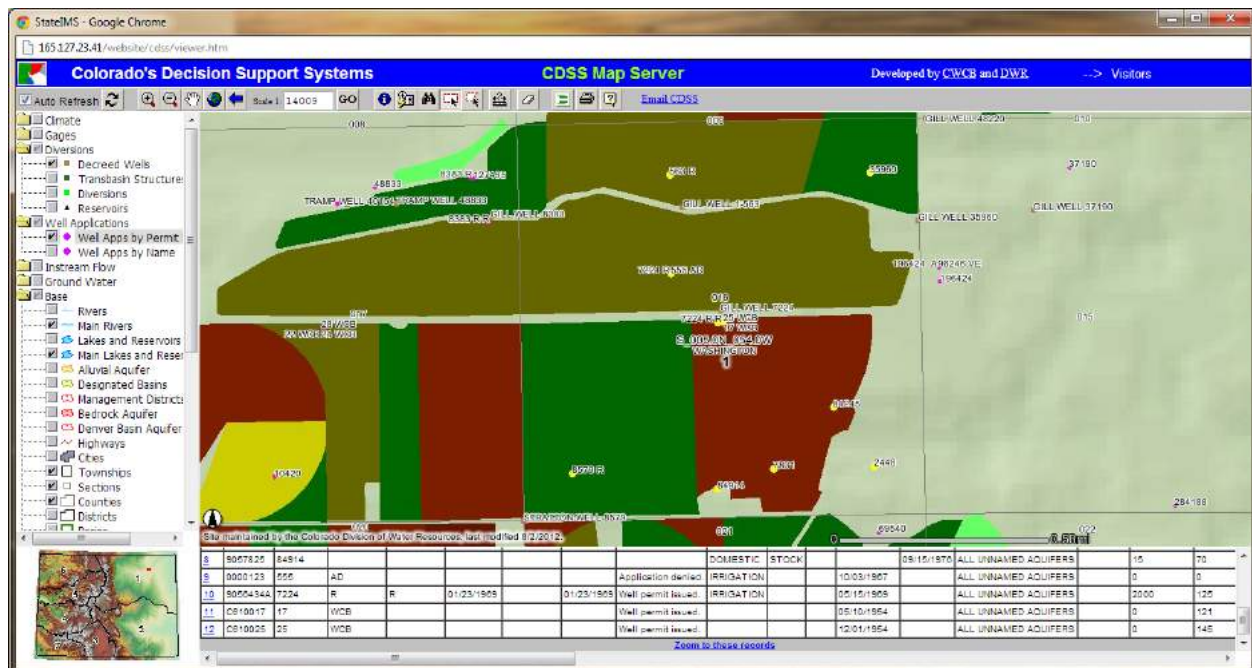
Using the *zoom* feature , zoom to Section 16 located west of Prewitt Reservoir. Note that there are both decreed and permitted wells located in the section of interest. This example focuses on the permitted wells as information for decreed wells can be accessed through the CDSS Water Rights viewer used in Example 2.

Step 2: Query for Permitted Wells and find associated ground water information.

To select specific features, the layer name in the layer list must be active – click the layer name, making sure it is highlighted gray. Activate the **Wells by Permit Number** layer and use the Select by Area tool



to select all the wells located in Section 16. There are 12 permitted wells in Section 16.



Tip: Permitted wells do not have a decreed water right, and limited information on the wells is generally available in HydroBase. This may be due to the use of the well (i.e. small domestic wells are exempt); the location of the well (i.e. some rivers are not over-appropriated and a well does not need a water right to pump); or the depth of the well (i.e. non-alluvial wells pump from Designated Basins and do not need a permit).

Attributes from the Well Permit layer reflect the information provided on the well permits. This includes uses, owner, well parameters and location parameters. For example, the following information is provided for Permit No. 8579R:

- first used in 1954
- permitted for irrigation use
- total depth of 121 feet
- yields 1800 gpm
- depth of 17 feet to static water level
- owned by State Land Board

Tip: Owner information was initially included in HydroBase, however is not a reliable source of information as the State does not track changes in ownership through time. It is best to confirm this information with the State.

Additional driller log information, geophysical log data, pumping test or volcanic material data information may be available. Select **Groundwater (Other)** from the **Online Tools** tab drop-down on the menu bar of the CDSS home. Help Files available include the **Groundwater (Other) Data Dictionary** and the **Groundwater (Other) Help File** which provide descriptions of information stored in HydroBase available through this query option.

Continuing with the example of Permit No. 8579R, select **Groundwater Data Type Pumping Tests** and query for **Permit Number 8579**.

Common Uses:

- Find driller log information, geophysical log data, or pumping test or volcanic material data (if available) for a specific well
- Determine Denver Basin bedrock top and bottom elevations
- Determine alluvial sand thickness

Developed for Internet Explorer version 8 or higher.

Water Division/District: All - Entire State
Groundwater Data Type: Pumping Tests

Date Last Refreshed: 2012-07-22

Well Name Permit Number Location Number USGS Site ID Legal Location Aquifer

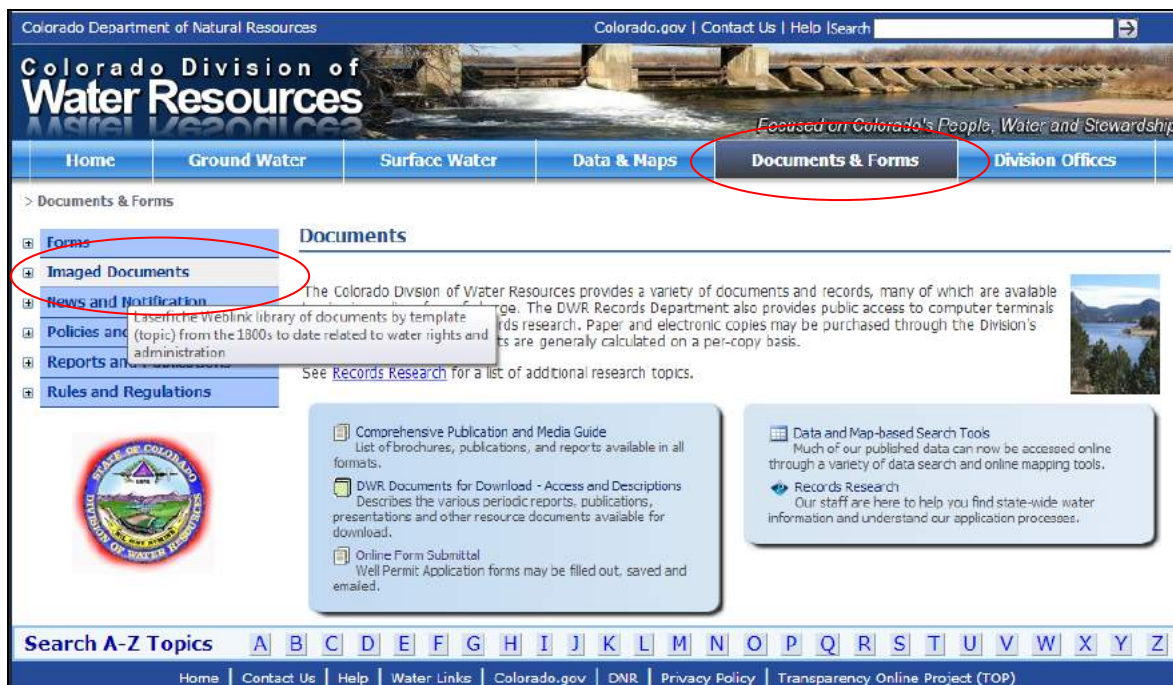
Permit Number: 8579

Submit Request

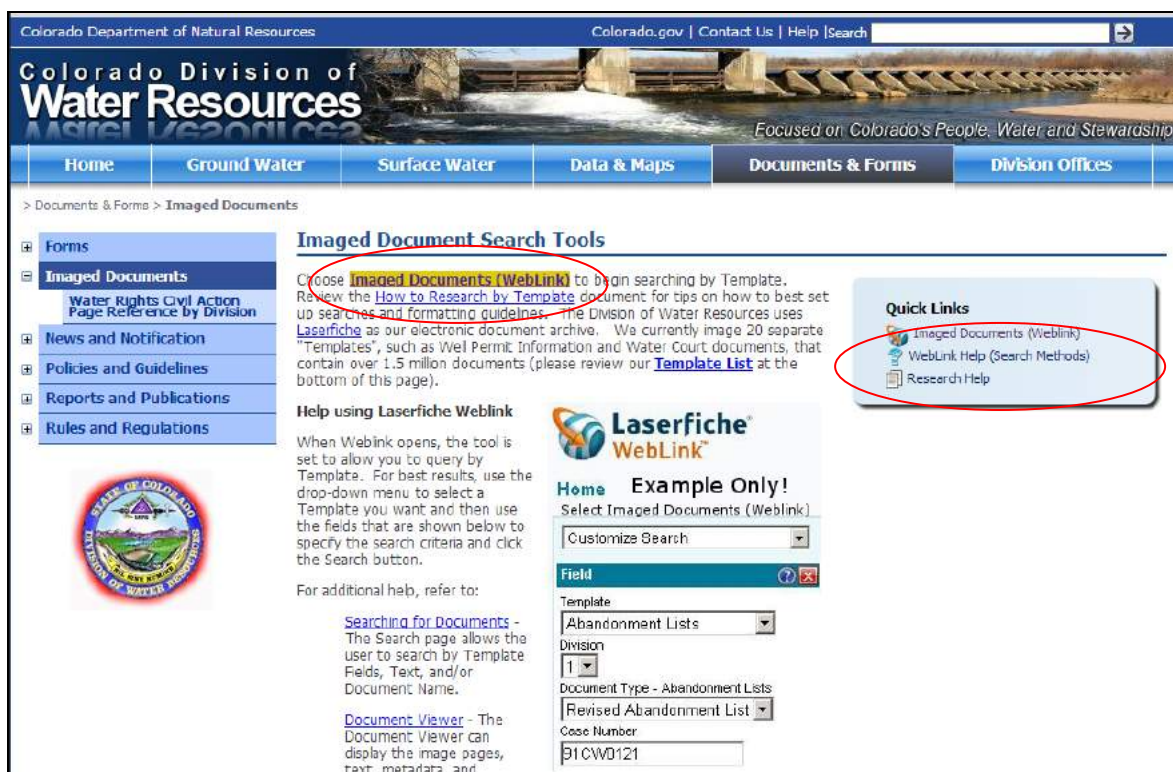
	WD	Well Name	Loc Number	Permit Info ▲	PM	Twshp	Range	Sect	Q160	Q40	Q10	Well Elevation	Well Depth	Test Type	T
	64	8579R	S800505416CC	8579-R	S	5N	54W	16	SW	SW			120	Specific Capacity	19

One record is returned, indicating a specific capacity pump test was performed on this well in 1978. No driller log information, geophysical log data, or volcanic material data is available for this permit.

The scanned version of the permit itself is available via the Colorado Division of Water Resources website through the Laserfiche WebLink network. From the Colorado Division of Water Resources website (water.state.co.us), select the **Documents & Forms** webpage. On this webpage, select the **Imaged Documents** option from the left side of the screen.



Once on the **Imaged Document Search Tool** page, note that there are links to help documents, including the **Weblink Help** and the **Research Help**, that provide guidance for search. Additionally, these documents provide links to other pertinent reports and information available from the Colorado Division Water Resources website, including the State's **Abandonment List**. Select the **Imaged Documents (Weblink)** link to search for the scanned permit for our example well.



Using the **Template Well Permit Information**, search for **Permitno 8579**. There are 4 results for this query.

Colorado Division of Water Resources Laserfiche WebLink

Home

Customize Search

Field: Well Permit Information

Permitno: 8579

Search Reset

Name	Hits	Page Count	Permitno	Permitsuf	Permitrpl	Receipt Number	Document Type - Well Permit	Annotated?
DWR_WP_00223905	0	3	8579			9078299	Original File	No
DWR_WP_00274834	0	8	8579	R		9056482	Original File	No
DWR_WP_00274835	0	4	8579	R	R	0069917	Original File	No
DWR_WP_00423931	0	15	8579	AD		0013265	Original File	No

4 Entries Results

Refer to the CDSS Map Viewer well results to determine the Receipt Number to narrow down which permit is associated with our example well. The Receipt Number for Well Permit No. 8579R is 9056482.

28 WCB	017	17 WCB 25	7224	016
24 WCB				

Rec	RECEIPT	PERMITNO	PERMITSUF	PERMITRPL	STAT_DATE	STAT_CODE	ACT_DATE
<u>1</u>	9056140	563	R		08/31/1959		08/31/1959
<u>2</u>	9056216	2448					
<u>3</u>	9056434	7224	R		04/08/1958		04/08/1958
<u>4</u>	9056452	7831					
<u>5</u>	9056482	8579	R		01/03/1958		01/03/1958
<u>6</u>	9057300	35960					
<u>7</u>	9057819	84245					
<u>8</u>	9057825	84914					
<u>9</u>	0000123	555	AD				
<u>10</u>	9056434A	7224	R	R	01/23/1969		01/23/1969
<u>11</u>	C610017	17	WCB				
<u>12</u>	C610025	25	WCB				

In the WebLink results, select the link under the **Name** column associated with the correct Receipt and Permit Number. The scanned permit for Well Permit No. 8579R will open, and the permit can be saved or printed.

Colorado Division of
Water Resources



My WebLink | Help | About | Logout

HomeDWR_WP_00274634

Metadata | Thumbnails | Annotations

DWR_WP_00274634

Last Modified
10/4/2009 3:48:27 AM
Creation Date
12/8/2007 12:29:41 AM

Fields

Template: Well Permit Information

Permitno
8579
Permitsut
R
Receipt Number
9056482
Document Type - Well Permit
Original File
Annotated?
No

TYPE OR
PRINT IN BLACK INK
COPY OF ACCEPTED
STATEMENT MAILED
ON REQUEST.

COLORADO DIVISION OF WATER RESOURCES
300 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

STATE OF COLORADO
COUNTY OF Washington } SS. AFFIDAVIT

STATEMENT OF BENEFICIAL USE OF GROUND WATER
XX AMENDMENT OF EXISTING RECORD Name Change Only
 LATE REGISTRATION

PERMIT NUMBER 8579 R LOCATION OF WELL

THE AFFIANT(S) State of Colorado, acting by and through County Washington
whose mailing the State Board of Land Commissioners
address is 1313 Sherman Room 620

RECEIVED
APR 04 77
WATER RESOURCES
STATE ENGINEER
COLORADO

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CDSS Products

1. Basin Operation Information

- Basin Fact Sheets
- Straight-line Diagrams
- Basin Information Reports
- Water Resources Planning Model User's Manual
- Supporting Technical Memoranda

From the Colorado's Decision Support Systems home page (<http://cdss.state.co.us/>), select the basin of interest under the **Basins** tab. Scroll to review Quick Facts. View and Select Documents of interest under the **Documents** tab. Selecting the basin, while leaving other query fields blank will show all the documents, shapefiles, and Geodatabases available for the basin. Documents will display in an internet browser, allowing the option to save in *.pdf format.

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Colorado's Decision Support Systems

Basins	Online Tools	Software Products	Modeling Data	GIS Data	Documents
Arkansas	Call Chronology	StateCU	Consumptive Use (StateCU)	Division 1 South Platte	Basin Reports
Colorado	Streamflow Stations	StateDMI		Division 2 Arkansas	Meeting Materials
Gunnison	Structures (Diversions)	StateMod	Surface Water (StateMod)	Division 3 Rio Grande	Modeling Briefs
Rio Grande	Water Rights	StateView	Groundwater (MODFLOW)	Division 4 Gunnison	Modeling Dataset Documentation
San Juan / Dolores	Map Viewer	StateWB	Water Budget (StateWB)	Division 5 Colorado	Peer Review
South Platte	Ground Water (Water Levels)	TSTool		Division 6 Yampa / White	Publications
Yampa / White		Third Party Software		Division 7 San Juan / Dolores	Reports
	More ...			More ...	More ...

Welcome to Colorado's Decision Support Systems!

Colorado's Decision Support Systems (CDSS) is a water management system developed by the Colorado Water Conservation Board (CWCB) and the Colorado Division of Water Resources (DWR) for each of Colorado's major water basins.

What's Available

The CDSS provides users with the following data, tools, and products:

- **Basins** - From water resource data access to sophisticated modeling, the DSS has been implemented, to various degrees, for all river basins within the state.
- **Online Tools** - These web-based tools can be used without additional software so that users can easily access all the CDSS's water data.
- **Software Products** - Specific software products used to develop the CDSS in various basins are available for users to download for either creating new models or using baseline data sets (Modeling Data).
- **Modeling Data** - Baseline data sets developed through the CDSS are available for various Software Products.
- **GIS Data** - Geographic Information Systems (GIS) data developed through the CDSS are available for download for each of the divisions throughout Colorado.
- **Documents** - Various documents related to the CDSS are also available so that users can view or download the latest reports, technical memoranda, publications, meeting materials, and more.

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Home | What is CDSS? | Contact Us
Search




Colorado's Decision Support Systems

Basins
Online Tools
Software Products
Modeling Data
GIS Data
Documents

Home > Basins > Gunnison

Basins

- Arkansas
- Colorado
- Gunnison**
- Rio Grande
- San Juan/Dolores
- South Platte
- Yampa/White

Gunnison River Basin

The Gunnison Basin covers over 8,000 square miles (approximately 8 percent of the state's area) in western Colorado. It extends from the Continental Divide to the confluence of the Gunnison and Colorado Rivers. Major tributaries include Dolores River, San Miguel River, and Uncompahgre River.



Quick Facts

DESCRIPTION	VALUE (APPROXIMATE)
Irrigated Acres (2005) ¹	286,250
Decreed Points of Diversion ¹	11,970
Decreed Wells ¹	1,800
Major Reservoirs ²	Normal Storage (acre-feet)
- Blue Mesa Reservoir - Morrow Point Reservoir - Taylor Park Reservoir	940,800 117,190 106,200
Major Imports into Basin ²	Average Diversions (acre-feet) (1971-2003)
- Leon Lake Tunnel - Mineral Ditch	1,364

Basin Updates

- No updates at this time

Additional Information

- GIS Data
- Modeling Data
- Online Tools

2. GIS Coverages

From the Colorado's Decision Support Systems home page (<http://cdss.state.co.us/>), select **GIS Data** tab. The File Download window guides you through either opening or saving the associated Geodatabase (ArcGIS 9.2 and later).

Colorado's Decision Support Systems

Basins Online Tools Software Products **Colorado's Decision Support Systems** GIS Data Documents

Home > GIS Data > Division 4 - Gunnison

GIS Data

Data by Category

- Division 1 - South Platte
- Division 2 - Arkansas
- Division 3 - Rio Grande
- Division 4 - Gunnison**
- Division 5 - Colorado
- Division 6 - Yampa/White
- Division 7 - San Juan/Dolores

Division 4 - Gunnison

Division 4 (Gunnison Basin) GIS data sets are available for download and can be used directly in ArcGIS. [Map Viewer](#) is a free web-based tool available to users and does not require ArcGIS.

GIS data layers are available as ESRI personal geodatabases, compatible with version 9.2 and later. Point features have been generated from the most recent HydroBase database by division and major data type. Data coordinates are in the UTM Zone 13 (NAD 83) projection. Polygon and other layers in some cases have been collected from other sources. Features generated from HydroBase contain only the minimum attributes for the data type.

GIS Data Library

TITLE/DESCRIPTION	FILE TYPE	LAST UPDATED
Division 4 Boundaries - division, district and county boundaries	Geodatabase	8/1/2011
Division 4 Climate Data - climate station, evaporation, temperature, precipitation, and solar radiation data	Geodatabase	7/31/2012
Division 4 Contours - topographic elevation in 50 meter contours	Shapefile	9/30/2004
Irrigated Lands - irrigated land coverages, associated ditch headgates and wells, and relational tables		
Division 4 Irrigated Lands 1993	Geodatabase	7/31/2012
Division 4 Irrigated Lands 2000	Geodatabase	7/31/2012
Division 4 Irrigated Lands 2005	Geodatabase	7/31/2012
Division 4 NHD - hydrography clipped to Division boundaries	Geodatabase	8/1/2011
Division 4 Structures - HydroBase based point data for diversion structures, wells, stream gages and reservoirs	Geodatabase	7/31/2012

The File Download window guides you through either running the program open the Geodatabase, or save the Geodatabase on your computer.

Information in the Geodatabase each division includes:

- Boundaries (Water division/district and County boundaries)
- NHD Hydrography (Rivers, lakes and reservoirs)
- Structures (diversions, wells, stream gages, and reservoirs)
- Climate Stations
- Irrigated acreage (for snapshot years)
- Contours (50 meter)
- Soil Data (AWC for CU analysis, Statewide only)

To download GIS layers, go through the Documents tab, select your basin to see available information, and download your divisions GIS layers. The File Download window guides you through either running the program to extract and save the layers, or saving the self-extracting zip file on your computer - allowing you to extract the layers at a later time.

Available layers for each division include:

- Water district boundaries
- Rivers
- Diversion structures
- Streamflow stations
- Climate stations
- Irrigated acreage (snapshot years)
- Lakes/Reservoirs
- Soil Data (AWC for CU analysis)
- Contour Lines
- Cities
- Highways
- Counties
- Hydrologic Unit Codes (HUCs)
- Land Use
- PLSS (public land survey system)
- Wells

3. General Water Resources Data

- Stored in HydroBase, more data in completed DSS basins
- Can be accessed through the CDSS Website (see Examples)
- Can be accessed through Data Management Interfaces (StateView, TSTool, StateDMI)

Available HydroBase data includes:

- Diversion records
- Streamflow measurements
- Water rights and well permits
- Climate data
- Call chronology
- Reservoir contents
- Groundwater levels
- Irrigated acreage
- Agricultural statistics
- Census data
- Owner/Operator information
- Structure physical information (headgate capacity, area/capacity curves)

4. Modeling Software and Data Sets

- StateCU – Consumptive Use Model
- StateMod – Surface Water Model
- Basin-specific Model Data Sets

Historical Crop Consumptive Use Analysis - Review

Definitions

1. Monthly Potential Consumptive Use (PCU) = *crop evapotranspiration*

- **Modified Blaney-Criddle** – outlined in SCS Technical Release 21
(*most common*)

$$PCU = k * f$$

$$f = t * p/100$$

$$k = k_t * k_c$$

where:

t = mean monthly air temperature

p = mean monthly percentage of annual daylight hours

k_t = temperature coefficient

k_c = crop coefficient

- **Original Blaney-Criddle** – outlined in FAO-24
(*typically used w/ calibrated coefficients developed from lysimeter data*)
- **Pochop Method** – outlined in Elevation – A Bias Error in SCS Blaney-Criddle ET Estimates
(*for bluegrass*)

Input Data:

- **Climate** – monthly temperature and frost dates
- **Latitude** – used to calculate daylight hours
- **Crop Type**
- **Crop Coefficients/Growing Season Triggers**

2. Monthly Effective Precipitation (Re) = *amount of monthly precipitation effective at serving crop needs*

Methods:

- **SCS** – outlined in SCS Technical Release 21
(*dependent on net depth of application and average monthly PCU*)
- **USBR**
(*linearly related to the monthly precipitation*)

Input Data:

- **Climate** – monthly total precipitation
- **Net Application Depth**

Adjustments to Climate Data:

- **Orographic Adjustment**– outlined in ASCE Manual 70

User Supplied adjustments, typical values:

Temperature – Adjust the climate station temperature down by 3.6 degrees per 1,000 feet rise in elevation between the irrigated acreage and the climate station location (based on the standard meteorological Environmental Lapse Rate)

Precipitation – Compute the ratio of the annual precipitation at the location of the irrigated acreage (using average annual Isohyetal maps) divided by the average annual precipitation at the climate station. Monthly values at the climate station are then multiplied by the ratio to estimate monthly values at the irrigated lands.

- Adjusts climate station data to location of irrigated lands
- Used when representative climate station data not available (e.g. high altitude irrigated areas)
- General “weight” climate station data if irrigated lands are located between multiple climate stations, in lieu of adjusting raw data

Adjustments to PCU:

- **Use Crop Coefficients Representing Local Conditions**
- **Elevation Adjustment** – outlined in ASCE Manual 70

10% upward for each 1,000 meters increase in elevation above MSL

- Corrects for lower mean temp at higher elevations that do not reflect crops' reaction to warm daytime temp and cool nights
- Applies to Modified B-C and Original B-C method (Pochop has separate built-in altitude adjustment)
- Applies to any crop type

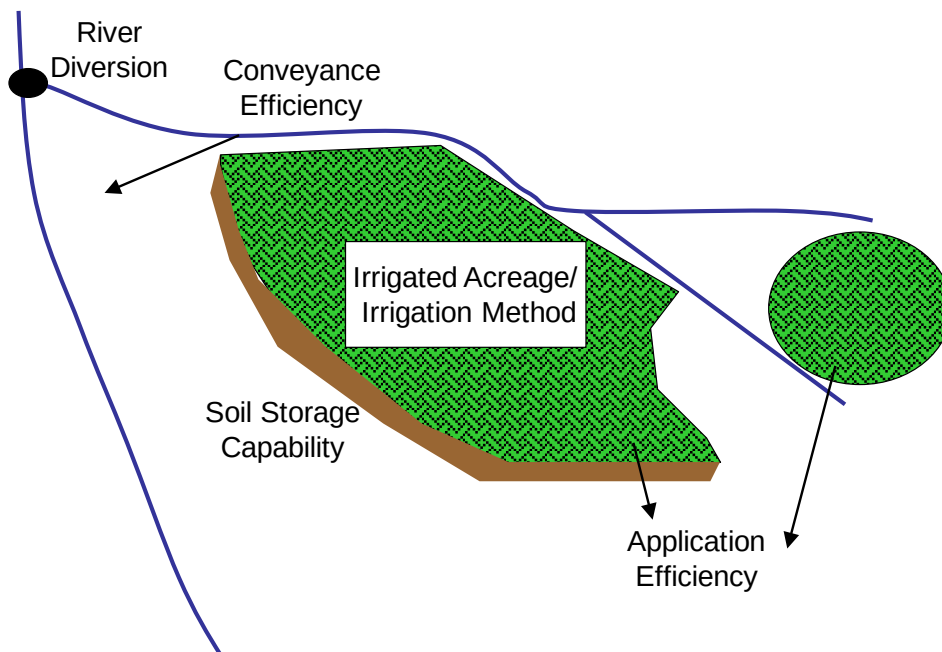
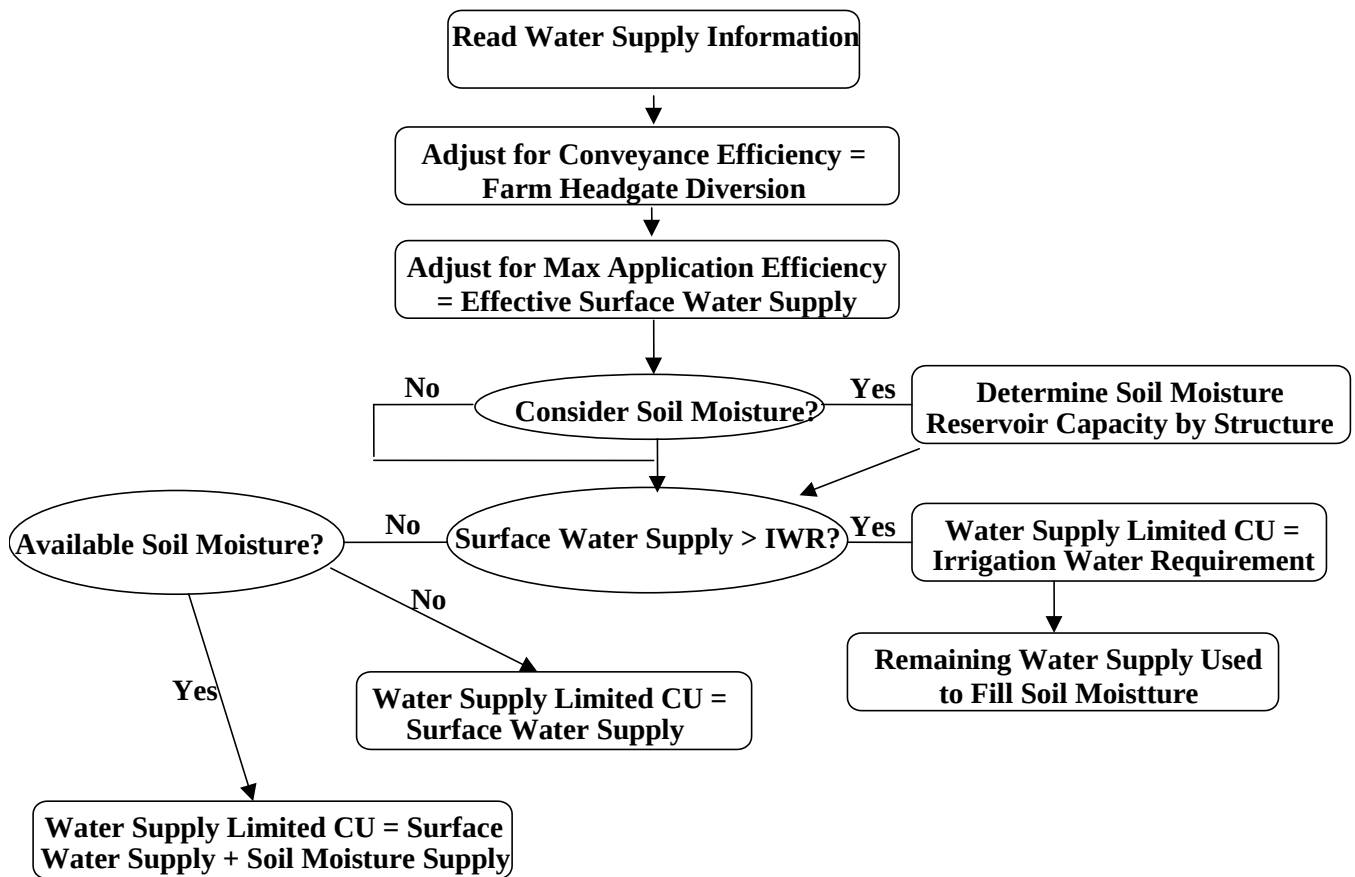
3. Monthly Crop Irrigation Requirement = the amount of water the crops could use from a full irrigation supply

$$\text{CIR} = \text{PCU} - \text{Re}$$

4. Supply-Limited Crop CU = Actual Crop Consumptive Use = Historical Crop Consumptive Use = Total Crop CU

The actual amount of water the crops consumed from irrigation supplies. This is the amount that can be transferred to another use or another location. The amount of water historical diverted (surface or ground water) but not-consumed by the crop due to conveyance and application losses is the *unlagged or total return flow obligation*. As a “Term and Condition” of the water right change or transfer, this amount must continue to be available to the river based on historical lagged patterns to assure junior uses are not injured.

Monthly Supply to the crop is compared to monthly CIR estimates based on a ditch-level water balance approach as follows:

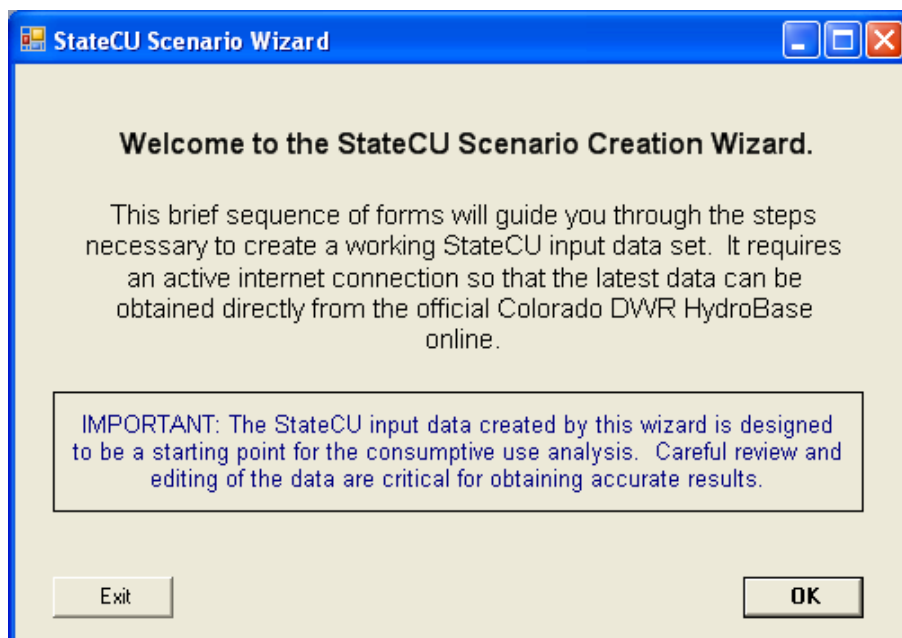


Example 5: Estimating crop CU for a specific ditch using the StateCU Wizard

Estimate the crop consumptive use for the Templeton Ditch in the Dolores River Basin. The StateCU model, and associated Documentation, is available on the CDSS website under the **Products** menu. Open **StateCU** by clicking on the application on your desktop or through an explorer window by clicking on the **StateCUI.exe** executable installed in the \cdss\statecu\bin\ subdirectory.

The HydroBase Wizard is an interactive tool that guides the user step-by-step through the development of a new monthly scenario and pulls required input data directly from HydroBase through an internet connection. The HydroBase Wizard can be used to create a new monthly *Climate Station Scenario* or a *Structure Scenario*. Required data (e.g. climate data, diversion records, crop characteristics) is pulled directly from HydroBase via an active internet connection and formatted into the correct input files. *Note that the purpose of the Wizard is to create a complete and operational scenario based on HydroBase data; it is the user's responsibility to review and edit specific data in the input files through the GUI to obtain accurate results.*

Activate the Wizard by selecting the **Create new StateCU scenario using HydroBase Wizard** command through the **File** menu. **Figure 5** displays the introductory screen to the Wizard. All screens in the Wizard have an **Exit** button. Select the **OK** button to proceed to Step 1.

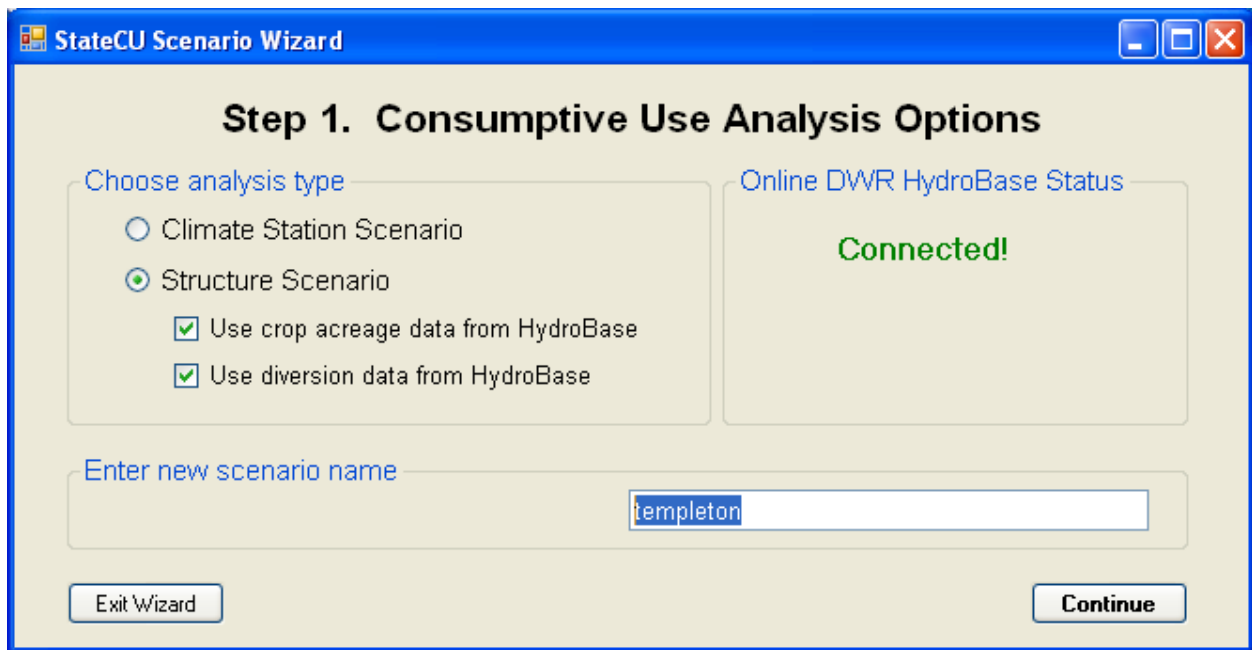


Step 1: Select Consumptive Use Options

Step 1 of the Wizard identifies the analysis as a *Climate Station Scenario* or a *Structure Scenario*. Using the radio controls, select the **Structure Scenario**. Select the option to use crop and acreage data from the data source and to use diversion data from the data source. The crop, acreage and diversion data loaded in HydroBase for the specific structure will be used when creating the input files. If either of these options is unchecked, the Wizard will ask for crop and acreage data to be manually entered in Step 3 and diversion data to be manually entered by the user in the GUI.

Note that the message of 'Connected' in green text will appear if there is an active internet connection. If an internet connection is not available, the message will state 'Not Connected!' in red text.

Enter a new scenario name avoiding special characters, spaces or periods in the file name. All input files will receive the same scenario 'base' name. The Wizard saves all new scenarios to the C:\CDSS\Data\StateCUWizard directory. Name this scenario "Templeton". Click on the **Continue** button to move to the next step.



The screenshot shows the 'StateCU Scenario Wizard' window at Step 1: Consumptive Use Analysis Options. The window has a blue title bar and standard Windows window controls. The main content area is divided into two panels. The left panel, titled 'Choose analysis type', contains two radio buttons: 'Climate Station Scenario' (unselected) and 'Structure Scenario' (selected). Below these are two checkboxes, both checked: 'Use crop acreage data from HydroBase' and 'Use diversion data from HydroBase'. The right panel, titled 'Online DWR HydroBase Status', shows 'Connected!' in green text. At the bottom of the window, there is a text input field labeled 'Enter new scenario name' with the text 'templeton' entered. Below the input field are two buttons: 'Exit Wizard' and 'Continue'.

Step 2: Select the structure for the analysis

A *Structure Scenario* created in the Wizard will determine the potential crop consumptive use, irrigation water requirement and water supply limited consumptive use for one or more crops at a specific diversion structure. Step 2 of the Wizard determines the consumptive use location (ditch) that will be used in the analysis. Select the radial button to Search by Name, and enter Templeton in the Search by window. The search can be narrowed, if desired. Narrow the search by Division, and select Division 4 for the Gunnison Basin. Select the green Refresh List button.

Highlight the Templeton Ditch in Water District 60 – San Miguel River basin. Click on the **View structure info** to view structure and diversion class information. Templeton Ditch has only one diversion class, S:1 F: U1 T: G:, indicating the structure only diverts Source 1 (river) for Use 1 (irrigation). Therefore, when performing the historical crop consumptive use analysis for Templeton Ditch, it is appropriate to use DivTotal through the headgate.

Preview diversion structure information	
Parameter Name	Value
Structure Name	TEMPLETON DITCH
Structure ID (WDID)	6000776
County	MONTROSE
Division	4
Elevation	-999.00
Latitude	38.360525
Longitude	-108.590332
UTM X	186280.2
UTM Y	4251921.9
Structure Type	Ditch
Structure diversion 1 code	Total
Structure diversion 1 start year	1974
Structure diversion 1 end year	2008
Structure diversion 2 code	S:1 F: U:1 T: G:
Structure diversion 2 start year	1974
Structure diversion 2 end year	2008

The diversion data can be previewed by clicking on the **View DivTotal**. Select the radial button for “Use structure DivTotal” and click the **Continue** button.

Step 3: Select crop(s) and acreage

Step 3 of the Wizard determines which crop(s) will be used in the analysis. Note that although acreage and crops can vary over time, the Wizard uses the single ‘snapshot’ of the most current CDSS acreage assessment data in this step and applies them to all years in the scenario. This data can be edited in the GUI to represent changes in cropping practices.

StateCU Scenario Wizard

Step 3. Select crop(s) and acreage

Note: The following are the most recent crops and acreages for this structure downloaded from HydroBase. The refresh button is disabled and all

Narrow the crop list by:

☒ Show All ☐ Crop Type ☐ Coefficient Type

Refresh list

Crop Name	Acres
☐ ALFALFA.TR21	0
☒ GRASS_PASTURE.TR21	20.09
☐ ORCHARD_WITH_COVER.TR21	0
☐ ORCHARD_WO_COVER.TR21	0
☐ GRAPES.TR21	0
☐ DRY_BEANS.TR21	0
☐ SPRING_GRAIN.TR21	0
☐ CORN_SILAGE.TR21	0
☐ SUGAR_BEETS.TR21	0
☐ CORN_GRAIN.TR21	0
☐ SWEET_CORN.TR21	0
☐ SNAP_BEANS.TR21	0

☒ Apply elev adj to all TR21 crop coefficients

View info about selected crop

Exit Wizard Continue

Based on the most recent CDSS Irrigated Acreage Assessment representing the year 2000, Templeton Ditch irrigates 20.09 acres of Grass Pasture. The Grass_Pasture.TR21 designation indicates that standard TR-21 coefficients will be used to estimate potential crop consumptive use. Highlight Grass_Pasture.TR21 and click the **View info about selected crop** button to see the parameters used to estimate growing season. The "Temperature Early Moisture" and "Temperature Late Moisture" indicates that the growing season will start when the mean monthly temperature reaches 45 deg F and end when it drops below 45 deg F. Note that these defaults are recommended in SCS TR-21, and can be revised by the user to reflect known irrigation practices.

StateCU: Crop information.

Parameter Name	Value
Crop Name	GRASS_PASTU...
Planting Month	1
Planting Day	1
Harvest Month	12
Harvest Day	31
Days to Full Cover (not used by Blaney-Criddle, used by PM)	110
Length of Season	365
Temperature Early Moisture (F) (source: generally SCS TR-21)	45
Temperature Late Moisture (F) (source: generally SCS TR-21)	45
Management Allowable Deficit Level (source: ASCE Manual...	50
Initial Root Zone Depth (ft) (source: ASCE Manual 70)	3.3
Maximum Root Zone Depth (ft) (source: ASCE Manual 70)	3.3
Available Water Holding Capacity	0
Maximum Application Depth (inch)	3
Spring Frost Date Flag (0=mean,1=28 deg,2=32 deg)	0
Fall Frost Date Flag (0=mean,1=28 deg,2=32 deg)	0
Days between 1st 2nd cuts for alfalfa	-999
Days between 2nd 3rd cuts for alfalfa	-999

The user can also revise the acreage and crop type, based on additional information by checking the boxes to select additional crops and entering or revising the associated acreage. The user can also choose to apply an elevation adjustment to all TR21 Crop Coefficients, using the check box in the lower left corner of the window. For this analysis, check the **Apply elev adj to all TR21 crop coefficients** and click on the **Continue** button to move to the next step.

Step 4: Select climate station(s)

Step 4 of the Wizard determines which climate station(s) will be used in the analysis. The *Structure Scenario* will only include one consumptive use location, however data from multiple climate stations can be used to determine the consumptive use. If multiple climate stations are selected, the Wizard equally weights the climate data from the multiple climate stations for the analysis. Select the **District** radial button in the “Narrow the search” by window and select Water District 50 – San Miguel River Basin. Six climate stations are available. Based on the location of Templeton Ditch, select Uravan to represent the climate conditions for this irrigated acreage.

Step 4. Select climate station(s)

Select one or more climate stations from the list below. If multiple climate stations are selected, they are equally weighted.

Search by
☐ ID ☒ Name

 Enter partial name/id or leave blank for all stations.

Narrow the search by
☐ Show All ☐ Division ☒ District ☐ County

ID	Name	Div	Dist	Prec. Start Year	Prec. End Year	Prec. Count
0228	AMES	4	60	1948	1986	4
6012	NORWOOD	4	60	1948	2008	7
6524	PLACERVILLE	4	60	1948	2008	6
8204	TELLURIDE 4 WNW	4	60	1900	2008	1
8454	TROUT LAKE	4	60	1948	1986	2
8560	URAVAN	4	60	1960	2009	5

View station info View Precip Data View Temp Data

Exit Wizard Continue

The **View station info** button displays physical information about the climate stations, including elevation and latitude. The **View Precip Data** and **View Temp Data** buttons provide monthly climate data and shows when/if data is missing. Review of the climate data indicates there is sufficient data for the analysis. Click on the **Continue** button to move to the next step.

Step 5: Choose the time period and describe the scenario

After completing the climate station selection in Step 4 of the Wizard, the user has determined all of the input parameters necessary to create a *Structure Scenario*. The Final Step of the Wizard is to set the

beginning and ending year of the analysis and enter a description of the scenario. Note that all time series data files will be created using these time period parameters. Through the GUI, an analysis can be adjusted to a smaller time period, but not a larger period, therefore it is recommended to define this period as large as available data can support.

Missing data in the input files is indicated by -999. The user can choose to have StateCU fill missing data “on-the-fly” with month averages or zeros through selecting **Missing time series data fill options** in the Final Step. Note that ‘on-the-fly’ filling will fill the missing data for the consumptive use calculations only; the original input file data will remain unchanged. Consumptive use calculations cannot be performed for years with any missing data. Edit the years by typing over the default or using the up and down arrows. When we reviewed available diversion records in Step 2 above, we noted that diversion records are available beginning in 1974. Set the **Begin Year** to 1974. In addition, we noted that there were a few months of missing climate data. Select the **Fill clim w/hist avg & div w/0** radial button. Enter a description of the scenario in the three allotted lines - this information is stored in the header of the model control options file and is included in certain output reports. Select the **Create New Scenario** to complete the creation of the scenario.

StateCU Scenario Wizard

Final Step. Choose time period and describe scenario.

New Scenario:

	Prec. Years	Temp. Years
Begin Year	1960	1960
End Year	2009	2009

Missing time series data filling options (str. scen. only):

- ☐ None
- ☐ Fill clim w/ hist avg & div w/ hist avg
- ☒ Fill clim w/ hist avg & div w/ 0
- ☐ Fill div w/ avg shrt; do not fill cli
- ☐ Fill div w/ 0 & do not fill clim
- ☐ Fill clim w/ hist avg & do not fill div

Choose a time period for the StateCU scenario above.

It is recommended to select the largest time period that might be needed, regardless of the data availability, as missing data can be filled via manual or automated methods through the GUI.

Enter a three line scenario description (stored in CCU file):

Templeton Ditch

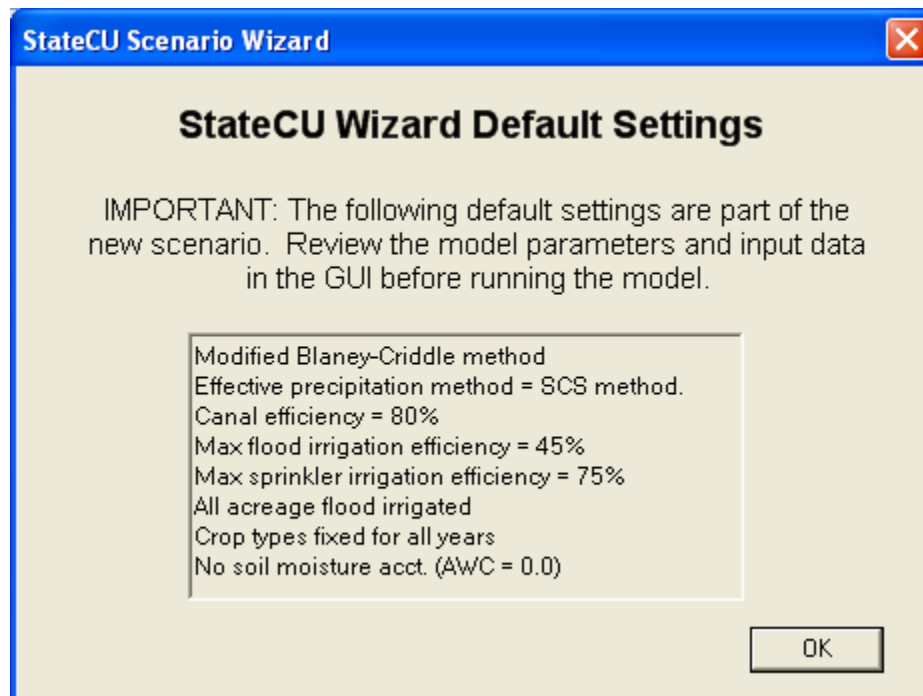
Historical CU Analysis using Uravan Climate Data

June 2009

Exit Wizard Create New Scenario

Several parameters and modeling options are not specifically input by the user into the Wizard, rather it is the responsibility of the user to review and edit these parameters through the GUI. The Wizard sets these parameters to defaults when creating the scenario. The default settings are listed in a window that is activated once the scenario is created. The following is a list of these defaults settings:

- The Modified Blaney-Criddle consumptive use analysis method is set
- The effective precipitation method is set to the SCS method.
- Crop types and crop acreages is fixed for all years
- Canal efficiencies are set to 80%
- Acreage is all set to be flood irrigated and crop types are fixed for all years (non-variable)
 - o The maximum flood irrigation efficiency is set to 45%
 - o The maximum sprinkler irrigation efficiency is set to 75%
- No soil moisture accounting and structure available water capacity is set to zero



Input data generated through the StateCU Wizard can be viewed and edited through the StateCU **Edit** menu. For more information and easy to follow instructions, including screen shots, see the StateCU Documentation.

Step 6: Run the simulation

Select the Run.. **Run Simulation** command under the main menu. When a run is initiated, the StateCU GUI shells out to a DOS window to execute the StateCU program. The process status and any warning or error messages are displayed in the DOS window during StateCU execution. If the execution is successful, the DOS window will either close automatically or prompt the user to press the Enter key, and the user will be returned to the GUI to view output. If the execution is unsuccessful, the StateCU

generated log file will be displayed on the screen with a description of the error that caused the program to terminate.

Tip: The user should view the **StateCU Fortran Program Log File** located in the **Results** menu or through a text editor even with a successful execution, as it may contain warnings or other pertinent information. In addition, the log file summarizes much of the data input.

Step 7: View the results

StateCU generates standard output reports that can be viewed through the GUI. Select the **Results..Detailed Water Budget Output (*.dwb)** to view annual, average monthly, and monthly results for the analysis. As shown, on average the annual Irrigation Water Requirement for the Templeton Ditch, based on the acreage assigned in HydroBase, is 54 acre-feet. The average Total Estimated Crop CU is 36 acre-feet, indicating the ditch does not receive a full supply.

Select the **Results..Time Series Data Report Generator (*.bd1)** to select specific water budget components to view, graph, and save. Click twice on the **Add Row from Data Source** button. Double click on the **ID (Name)** and select “6000776 (TempletonDI)” from the drop-down list in both rows. Double click on the Data Type in row 1 and select “Irrigation Water Req” from the drop-down list. Double click on Data Type in row 2 and select “Total Crop CU” from the drop-down list.

StateCU Time Series Data Tool

File View Help

Select Data Source: Enter an existing StateCU binary output file (*.BD1)

C:\CDSS\Data\StateCU\Wizard\Templeton\Templeton.BD1 Browse for File

Select Data to View: Add rows to the following table for each time series variable to view in the report from the above source.

Add Row from Data Source Delete Selected Row Delete All Rows

	STATION TYPE	ID (NAME)	INTERVAL	DATA TYPE	UNITS	I/O TYPE	SOURCE FILE NAME
1	CU Structure	6000776 (TEMPLETON DI)	Month	Irrigation Water Req	AF	StateCU Output	tateCU\Wizard\Templeton\Templeton.BD1
2	CU Structure	6000776 (TEMPLETON DI)	Month	Total Crop CU	AF	StateCU Output	tateCU\Wizard\Templeton\Templeton.BD1

Select the report time period

Begin Year 1974 End Year 2009

Select a particular report or output type for the above time series:

Tabular Data Preview (columnar grid) StateMod STM File

Excel Graph and Worksheet Custom Columnar Report File (*.CCR)

Time Series Summary File (text)

Create IDS AWAS "import" file using ALL structures in BD1 file

After selecting the time series data, select the time period and then choose a graph, summary report or table.

Close

The results can be viewed in several formats, described in the StateCU Documentation. Select the **Excel Graph and Worksheet** button. The data is loaded into a Data worksheet in Excel and a corresponding Graph worksheet is created. The Excel spreadsheet can be saved and the graphical presentation revised.